VOL. XXIII. Nº12. DECEMBER 1938

MECCANO MAGAZINE



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6d.

THE 1938-9 HORNBY BOOK of TRAINS



The 1938-9 issue of the "Hornby Book of Trains" should be in the hands of every railway enthusiast.

The beautiful coloured cover shows a striking picture of the famous "*Cornish Riviera Limited*," specially painted by the well-known artist Bryan de Grineau. The contents of the Book are more varied than ever. They include articles, fully illustrated by splendid photographs, dealing with little-known features of railway goods traffic, automatic train control on the G.W.R., the famous L.N.E.R. and L.M.S. expresses on the London-Scotland routes, the mysteries of the Travelling Post Office, and the Continental Boat Trains of the Southern Railway.

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How to obtain the Book

The Hornby Book of Trains may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written.

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Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool 13, sending 6d. in stamps with their order.

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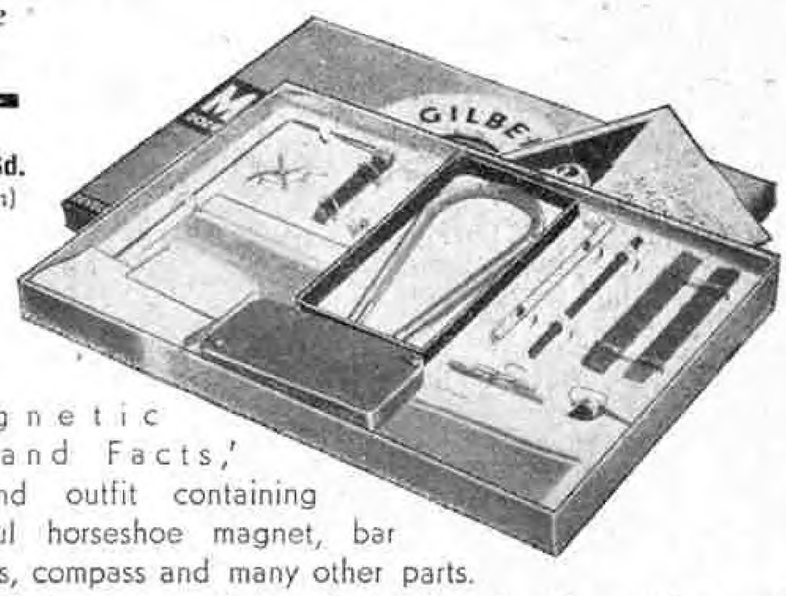
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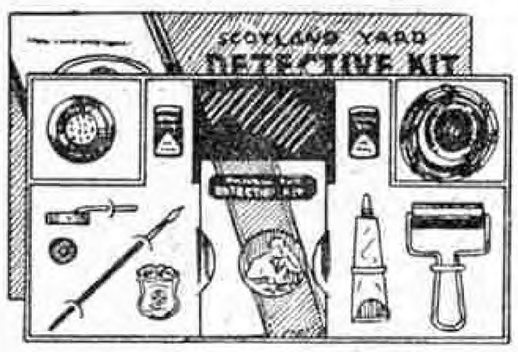
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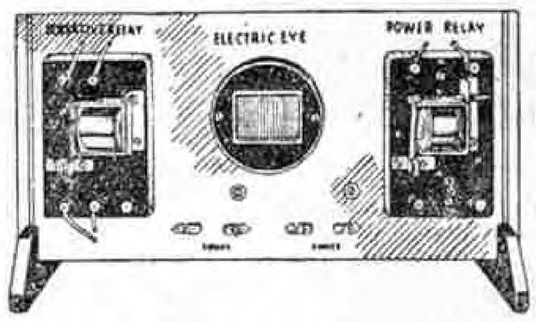


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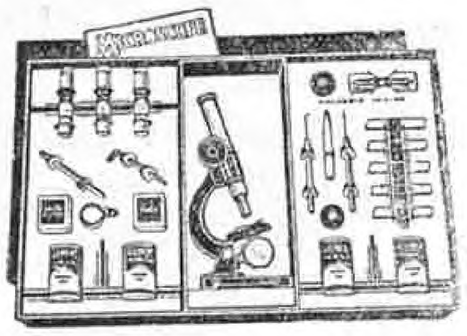


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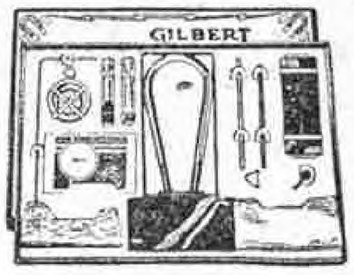
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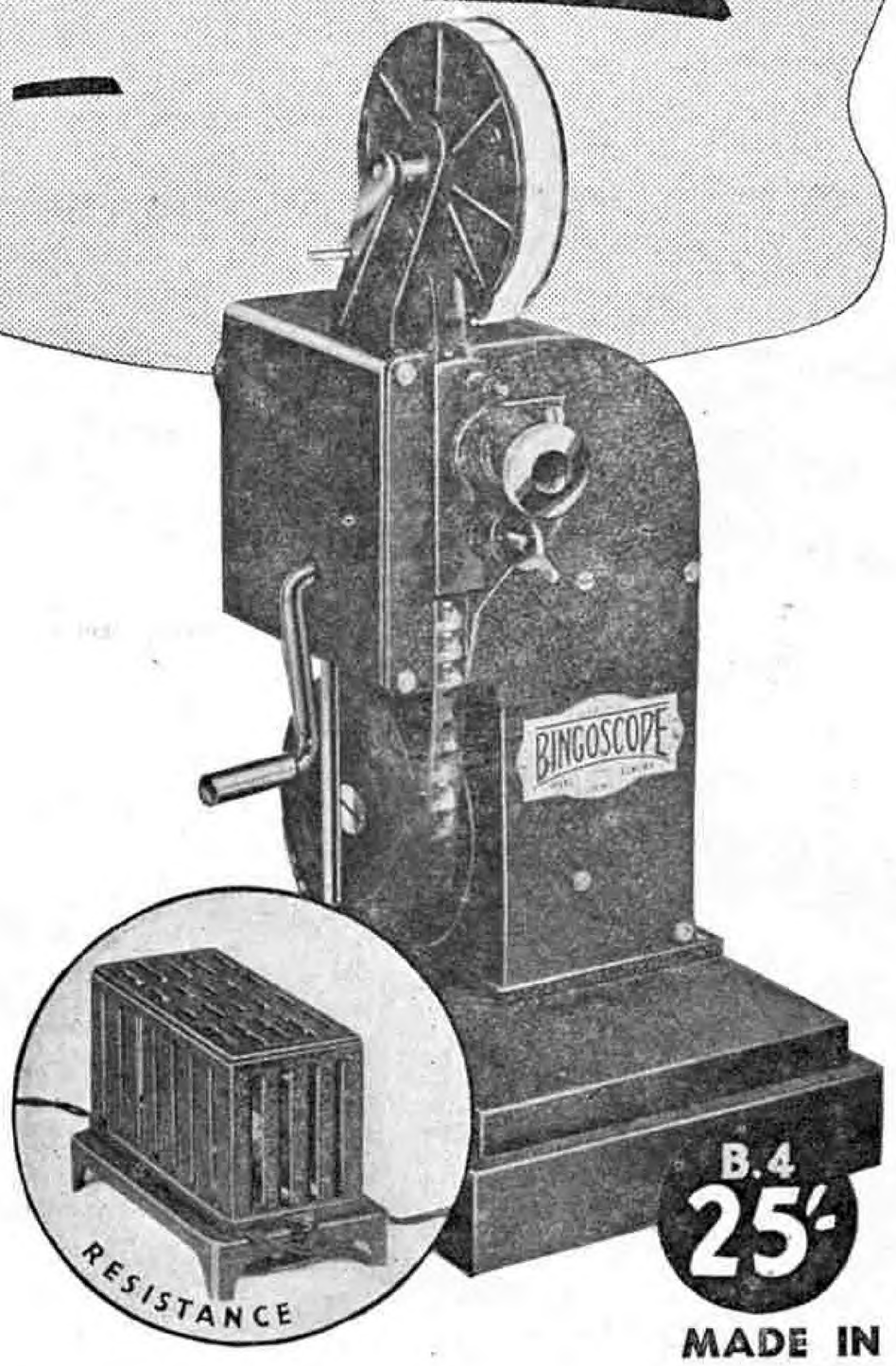
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8 ft. 1/-; 15 ft. 1/6; 30 ft. 3/9; 60 ft. 6/6

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Specially selected stories, full of fun and excitement.
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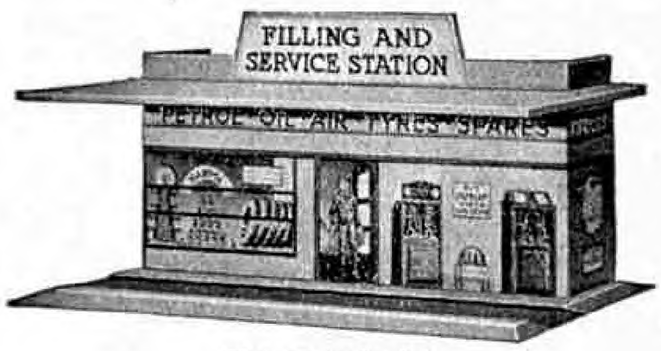
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OVER 300 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. This season many new items have been introduced including wonderful scale models of military Tanks and Aeroplanes, latest types of Motor Cars, complete with driver and passenger, and many others.

Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

PETROL STATION



Dinky Toys No. 48
Accurate reproduction of a filling station
Price **1/3** each

ARMSTRONG WHITWORTH "ENSIGN" AIR LINER



Dinky Toys No. 62p
Scale model of the largest British air liner.
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JUNKERS Ju 90 AIR LINER



Dinky Toys No. 62n
Scale model of the latest type of German air liner, having a top speed of 256 m.p.h. Price **11d.** each

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Realistic model of the Belisha Safety Beacon.
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Assorted colours. Fitted with detachable rubber tyres.
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Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

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Dinky Toys No. 60y
Realistic model of Thompson Bros. Tender used for refuelling aeroplanes at aerodromes.
Price **8d.** each

AEROPLANES



Dinky Toys No. 61z
This set consists of six models of French Aeroplanes—Dewoitine 338, Dewoitine 500d, Potez 58, Potez 56, Hanriot H180M and Farman F360. (Made in the Meccano Factory in Paris.)
Price **3/-**

DOUGLAS D.C.3 AIR LINER
Dinky Toys No. 60t
A scale model of a Douglas D.C.3 air liner, a type in regular service on American and European routes.
Price **9d.** each



EMPIRE FLYING BOATS



Dinky Toys No. 60r
Scale models of the famous Imperial Airways Flying Boats
Twelve models available named: "*Caledonia*," "*Canopus*," "*Corsair*," "*Challenger*," "*Centurion*," "*Cambria*," "*Calpurnia*," "*Ceres*," "*Clio*," "*Calypso*," "*Corinna*" and "*Cheviot*." Price **1/-** each

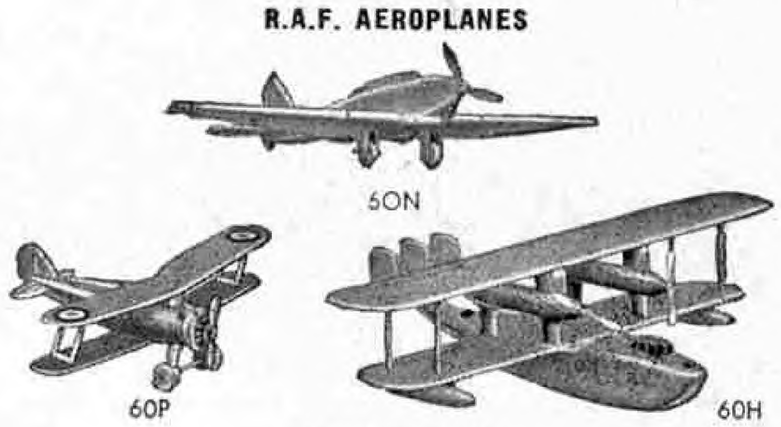
AIRSPEED "ENVOY" MONOPLANE



Dinky Toys No. 62m
Scale model of the Airspeed "Envoy" twin engined commercial monoplane. Assorted colours.
Price **6d.** each

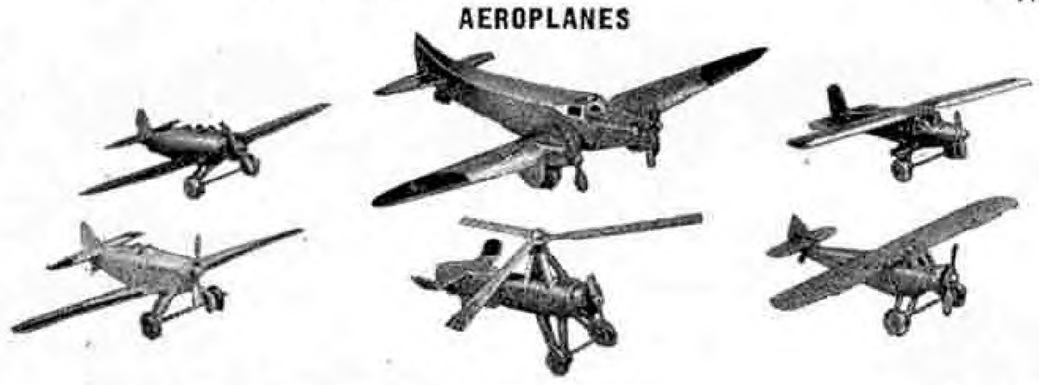
THE KING'S AEROPLANE
Dinky Toys No. 62k
Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight.
Price **8d.** each

R.A.F. AEROPLANES



Dinky Toys No. 61
No. 60h "Singapore" Flying Boat ... ... each **1/-**
No. 60n Fairey "Battle" Bomber (2) ... ... „ **4½d.**
No. 60p Gloster "Gladiator" Biplane (2) ... ... „ **6d.**
Price of complete set **2/9**

AEROPLANES



Dinky Toys No. 60z
The set consists of six models of famous French aeroplanes—"Arc-en-Ciel," Potez 58, Hanriot H180T, Breguet-Corsaire low wing monoplane, Dewoitine 500 and Cierva Autogiro. (Made in the Meccano Factory in Paris.)
Price **3/-**

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A scale model of the famous French triple-engined monoplane "Arc-en-Ciel." (Made in the Meccano Factory in Paris.)
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Dinky Toys No. 60s
Similar to Fairey "Battle" Bomber (No. 60n), but with Air Ministry Shadow Shading.
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Dinky Toys No. 60v
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Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937
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MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

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Dinky Toys No. 23m
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SIX-WHEELED WAGON



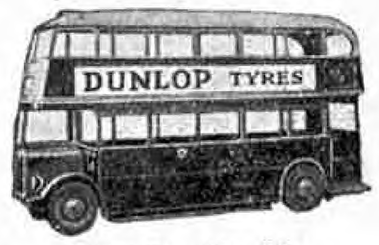
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An interesting model of a modern three-ton wagon. In assorted colours.
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TAXI WITH DRIVER



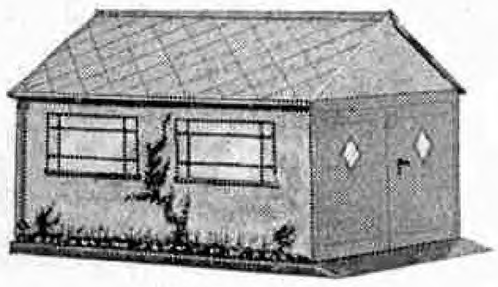
Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each

DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

GARAGE



Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars.
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POLICE MOTOR CYCLIST

Dinky Toys No. 37b



Price **6d.** each

CIVILIAN MOTOR CYCLIST

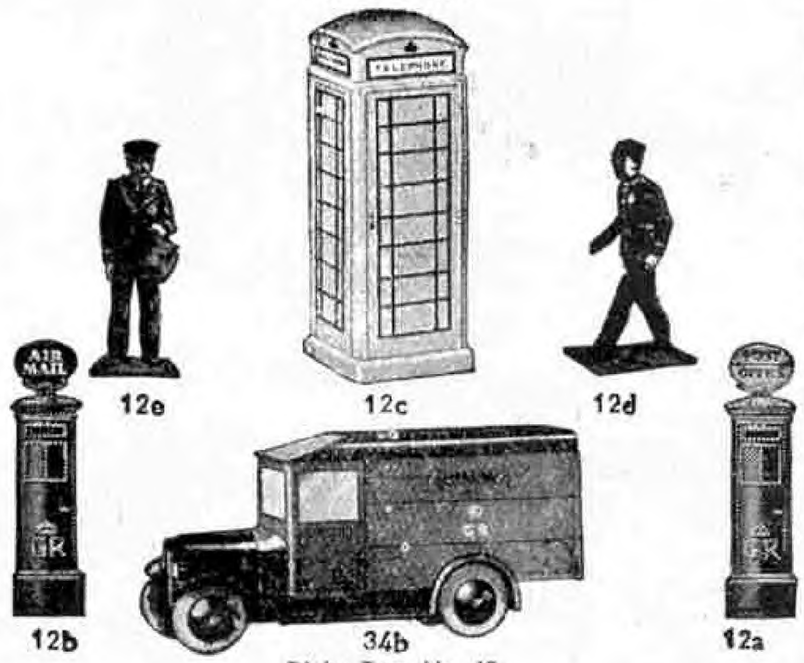
Dinky Toys No. 37a



Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Fitted with solid rubber wheels. Price **6d.** each

POSTAL SET

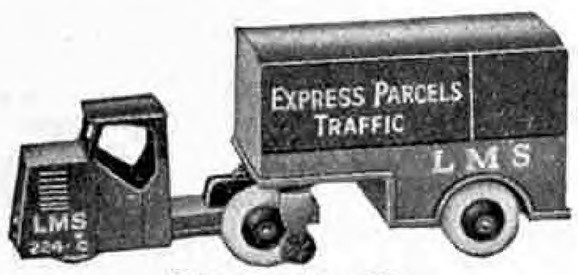


Dinky Toys No. 12

No. 12a	Pillar Box, G.P.O.	each **3d.**
No. 12b	„ „ Air Mail	„ **3d.**
No. 12c	Telephone Call Box	„ **4d.**
No. 12d	Telegraph Messenger	„ **3d.**
No. 12e	Postman	„ **3d.**
No. 34b	Royal Mail Van	„ **10d.**

Price of complete set **2/3**

RAILWAY MECHANICAL HORSE AND TRAILER VAN



Dinky Toys No. 33R
Fitted with detachable rubber tyres.

No. 33Ra	Railway Mechanical Horse	each **8d.**
No. 33Rd	Trailer Van	„ **10d.**

Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

ROYAL TANK CORPS LIGHT TANK SET



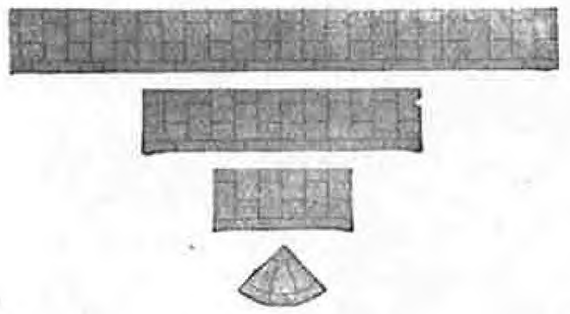
152c 152a 150d 152b

Dinky Toys No. 152

No. 152a	Light Tank (4½ tons, 25 h.p.) ...	... each **1/2**
No. 152b	Reconnaissance Car	... „ **1/–**
No. 152c	Austin Seven Car	... „ **4d.**
No. 150d	Driver	... „ **3d.**

Price of complete set **2/9**

PAVEMENT SET



Dinky Toys No. 46
The contents of this set are four 3 in., six 6 in. and four 12 in. strips of pavement and four quarter discs for corners. Price of complete set **6d.**

SMALL CARS



Dinky Toys No. 35 Fitted with solid rubber wheels.
No. 35a Saloon Car each **3d.** No. 35b Racer each **3d.**
No. 35c "M.G." Sports Car ... ... „ **3d.**
Price of complete set **9d.**

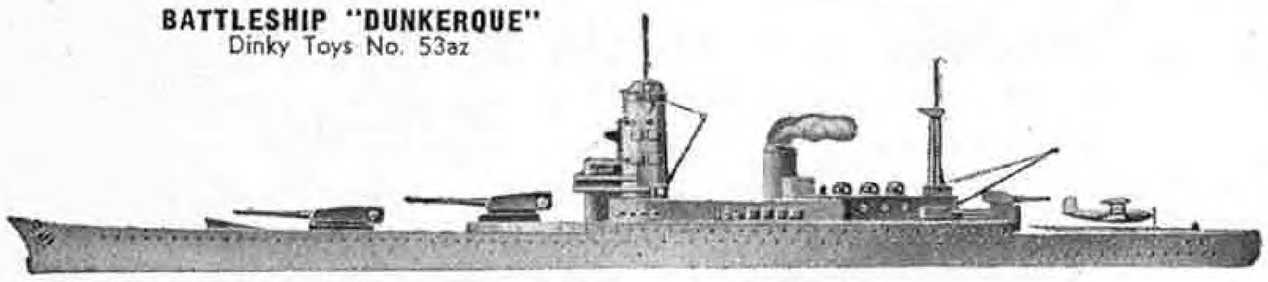
AUSTIN SEVEN CAR

Dinky Toys No. 35d

This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each.

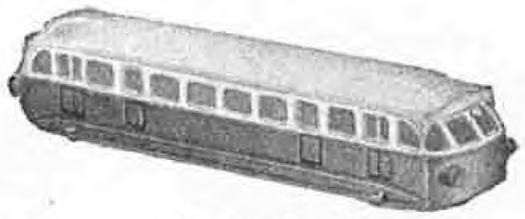
BATTLESHIP "DUNKERQUE"

Dinky Toys No. 53az



Scale model of the French 26,500 ton Battleship "*Dunkerque*," which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris.)

DIESEL RAIL CAR



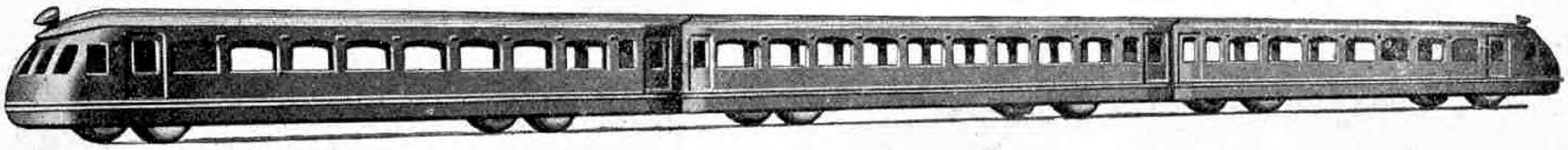
Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each
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Dinky Toys No. 14z
Fitted with opening lid.
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Dinky Toys No. 16z Price **1/6** each
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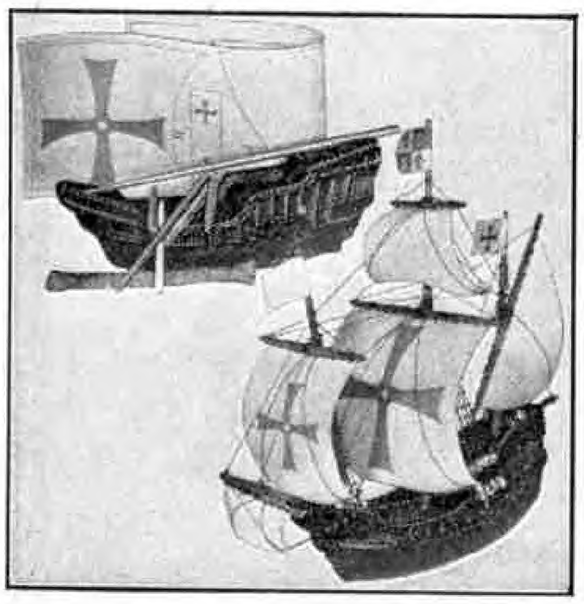
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The Crazy Adventures of the 'Madcap' Family—so funny it must be seen to be believed. Father Christmas is there with his Lucky Parcels!

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YOURS FOR 9/- Balance in Five Monthly Payments of 9/-

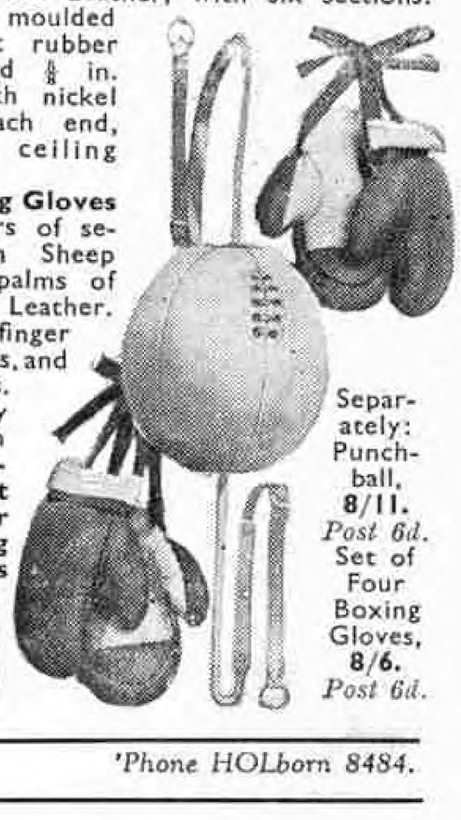
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Solid Para Rubber Cushions.
Bed and Cushions covered with excellent quality English Woven Cloth.
Brassed Pocket Plates, leather covered and fitted Cord Pocket Nets.
Adjustable rubber covered feet for levelling table.
Supplied with the following accessories: Set of 3 guaranteed turned composition 1⅛ in. Billiard Balls. Two 4 ft. Cues. Large Marking Board, fitted with brass runners and pointers. Chalk and Book of Rules.



WITH 16/6 SNOOKER SET £3/6/0 or 8 Monthly Payments of 9/-
Please state whether Mahogany finish or Oak rail.
Stand for this Table 23/6 extra. *Carriage 2/6 England or Wales.*
Overall Size of Table 5 ft. 4 in. by 2 ft. 9 in.

SET OF BOYS' BOXING GLOVES AND PUNCHBALL

The Punchball is made from good quality Chrome Suede Leather, with six sections. Fitted ½ in. moulded resilient rubber strands and ⅝ in. straps, with nickel ring at each end, floor and ceiling hooks.
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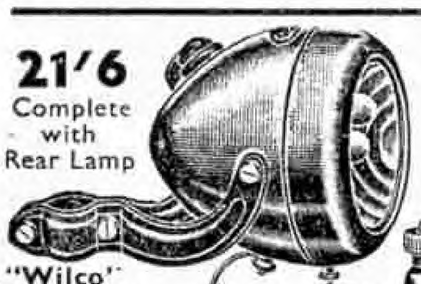


Separately: Punchball, **8/11.** *Post 6d.* Set of Four Boxing Gloves, **8/6.** *Post 6d.*

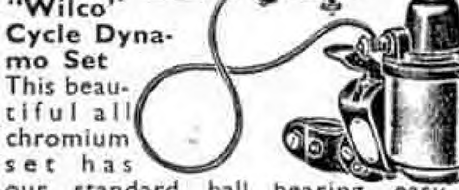
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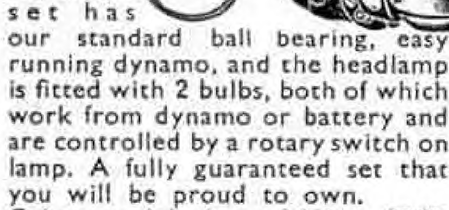
21/6 Complete with Rear Lamp



"Wilco" Cycle Dynamo Set This beautiful all chromium set has our standard ball bearing, easy running dynamo, and the headlamp is fitted with 2 bulbs, both of which work from dynamo or battery and are controlled by a rotary switch on lamp. A fully guaranteed set that you will be proud to own.
Other models from **14/9** to **23/9.**



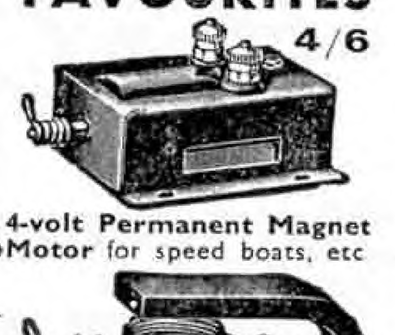
Miniature Fittings. Complete with bulb, flex and clip for battery. 1⅛" to 2¼" high. Each **1/-** Post 2d.



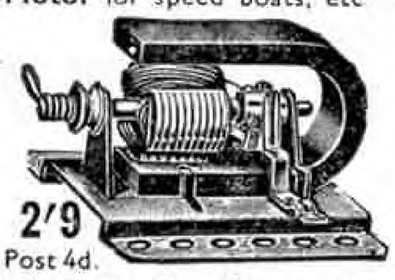
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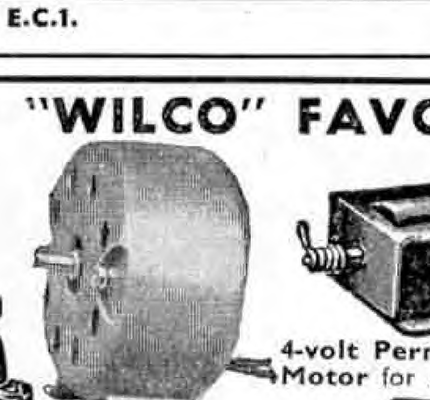
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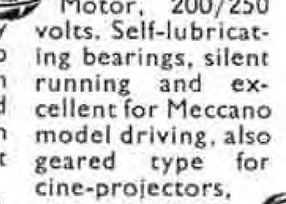
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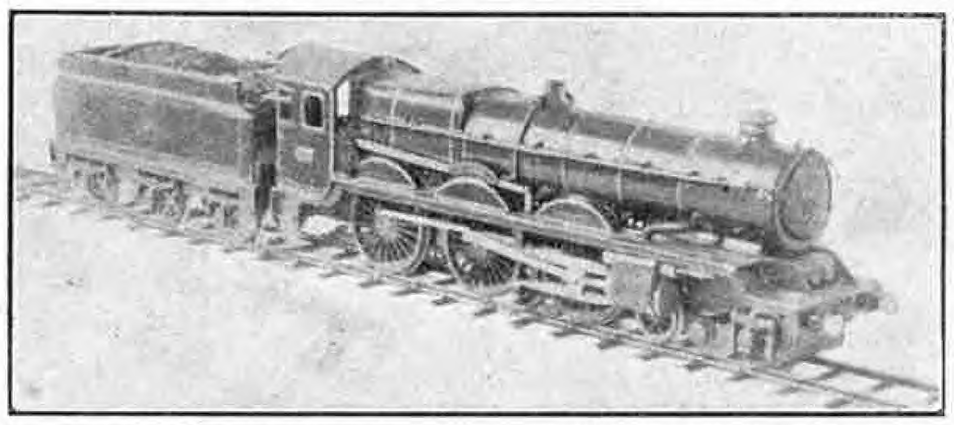


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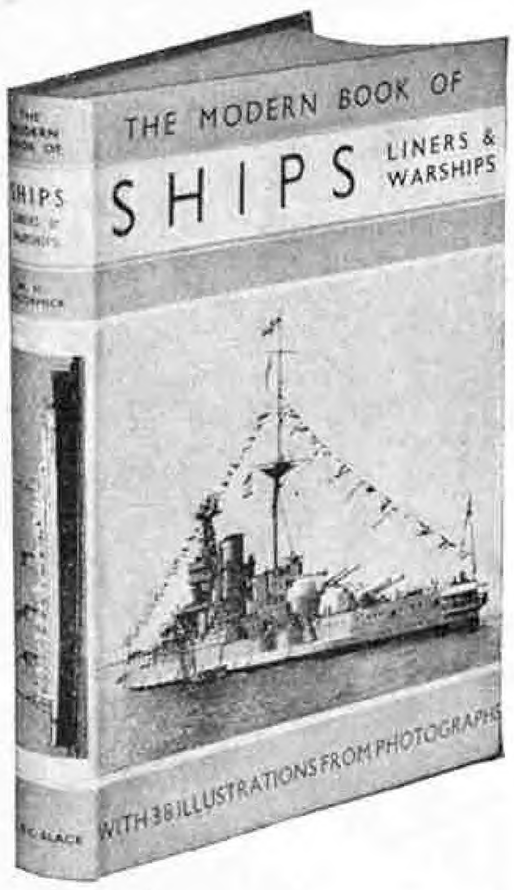
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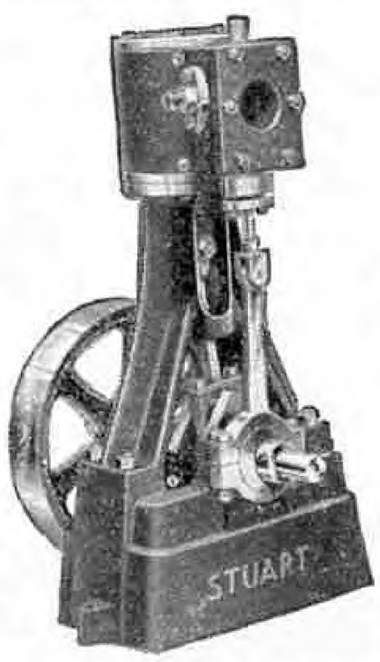
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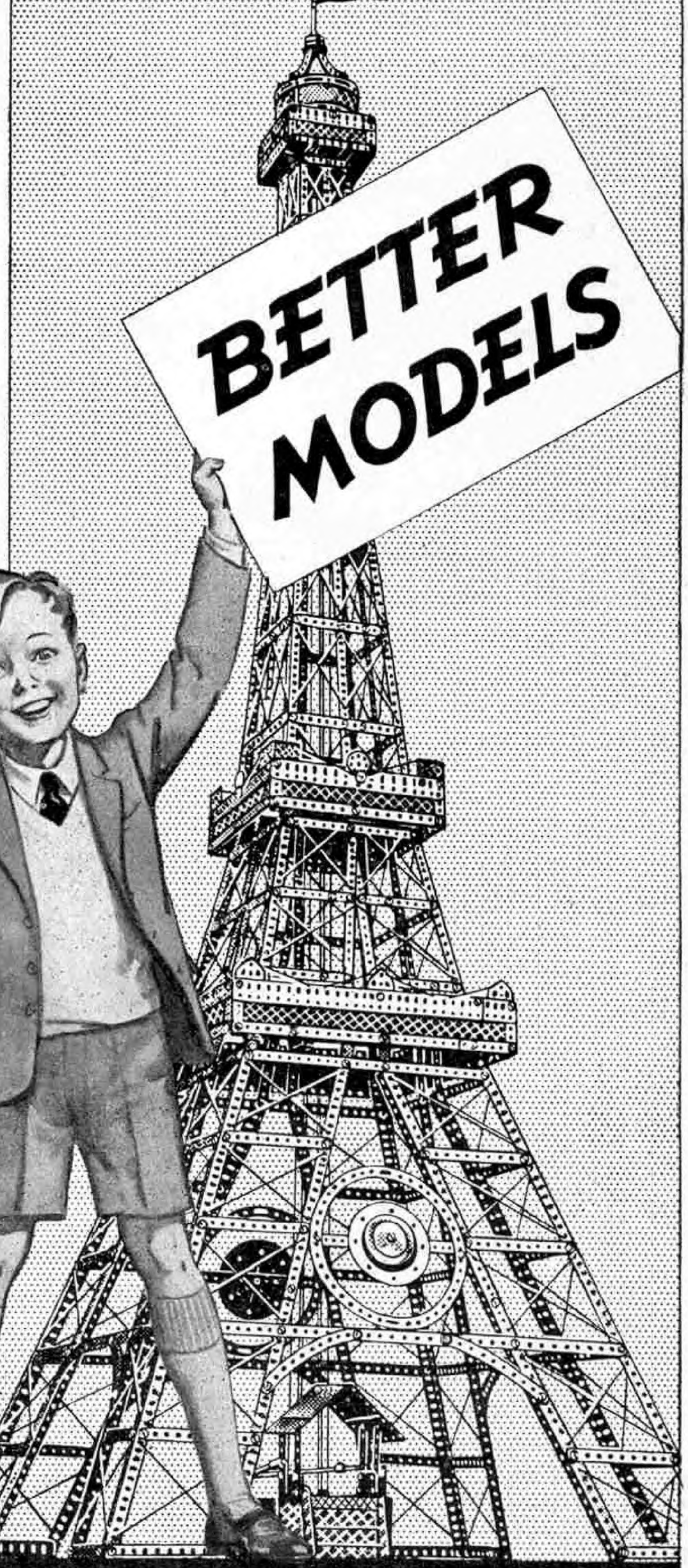
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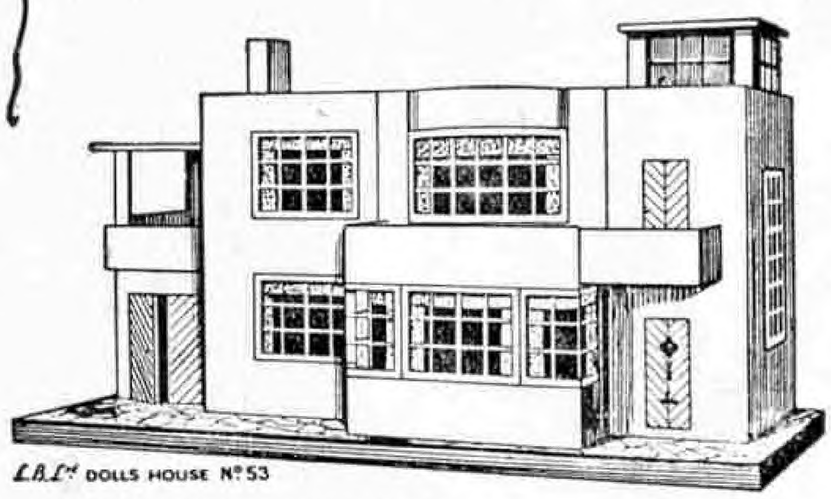
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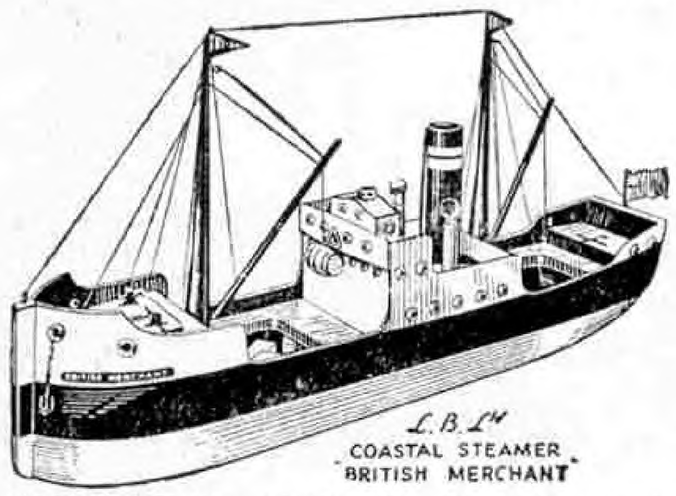
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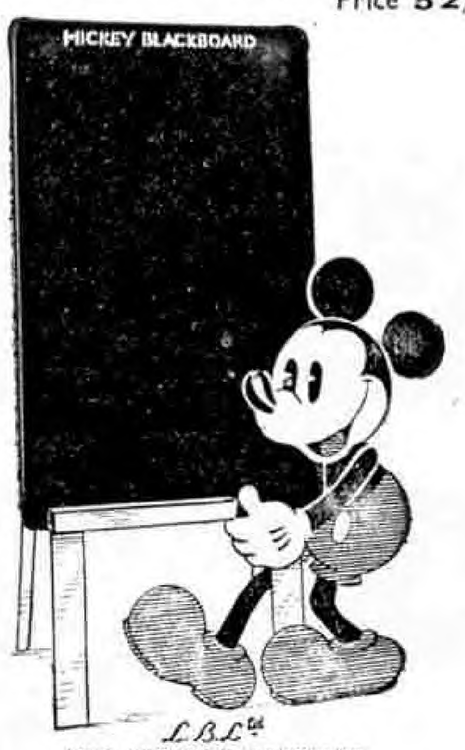
24KB DOLL'S PRAM. New design. Steel body nicely upholstered. Tangent spoke wheels. 8½ x 1 in. cushion tyres. Two pair dressguards and footbrake fitted. All bright parts including handles, wheels, etc. CHROMIUM PLATED. Length of body 24 ins. Price **52/6**



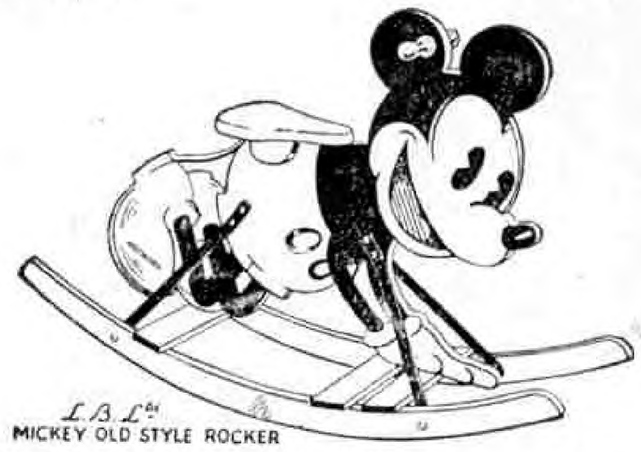
DOLL'S HOUSE No. 93. Fashionable Tudor design. Half-timbered gables and front. Built-in garage with opening doors. Two bedrooms, dining room, bathroom and kitchen, with dummy range, dresser and sink. Four ELECTRIC wall lights with switches. Red tiled roof. Steps and dummy shrubs. Length 47¼ ins. Price **75/-**



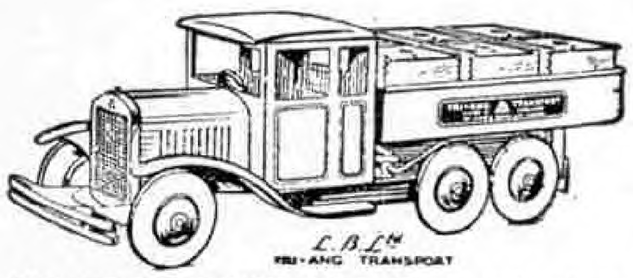
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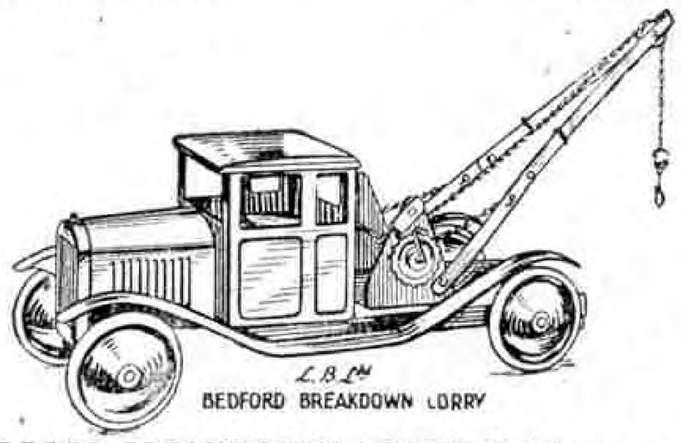
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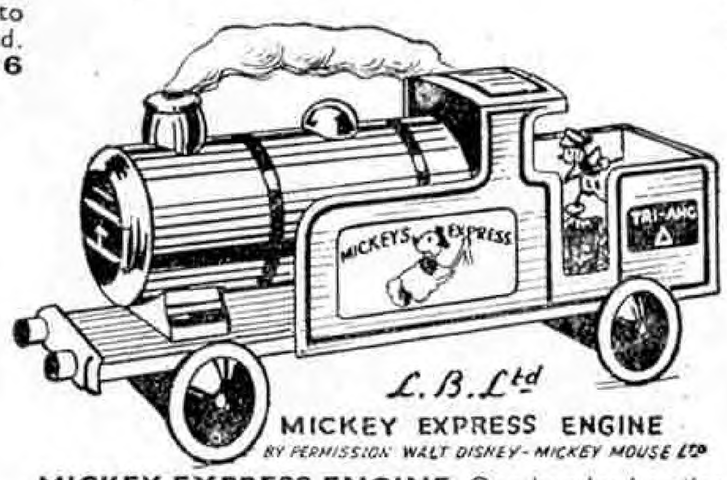
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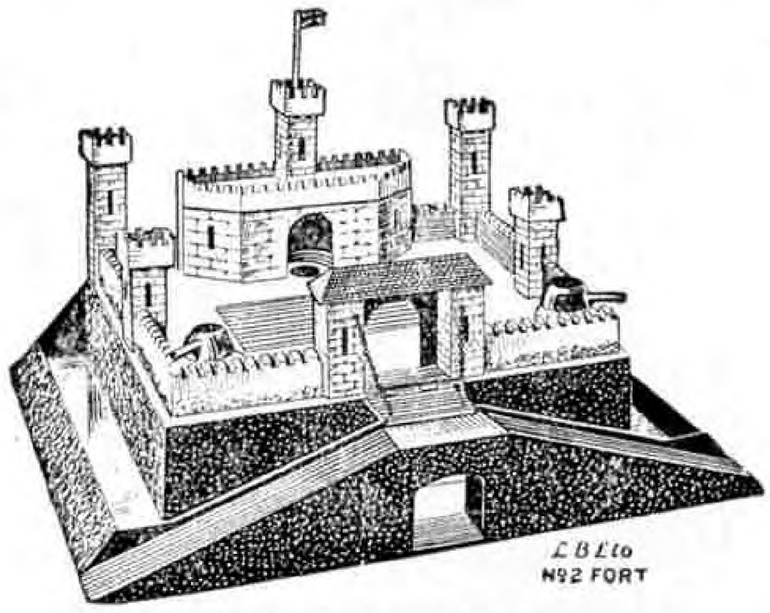
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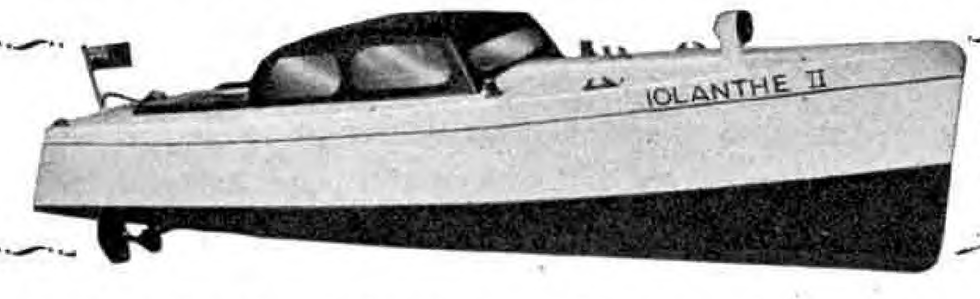
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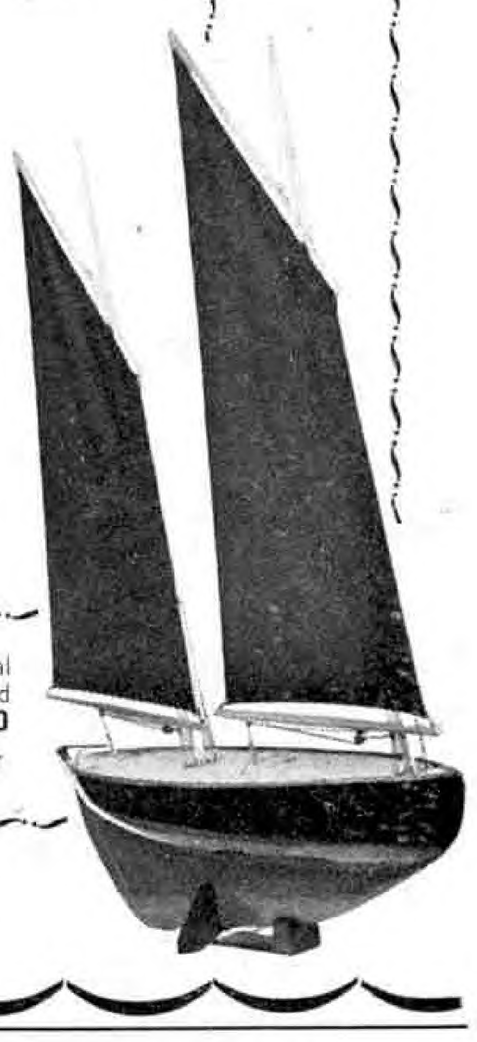
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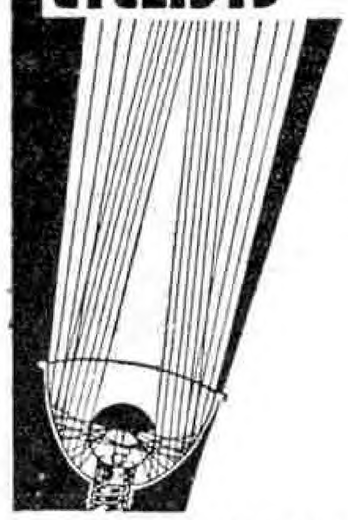
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760	6	.3	1.8	7½d.
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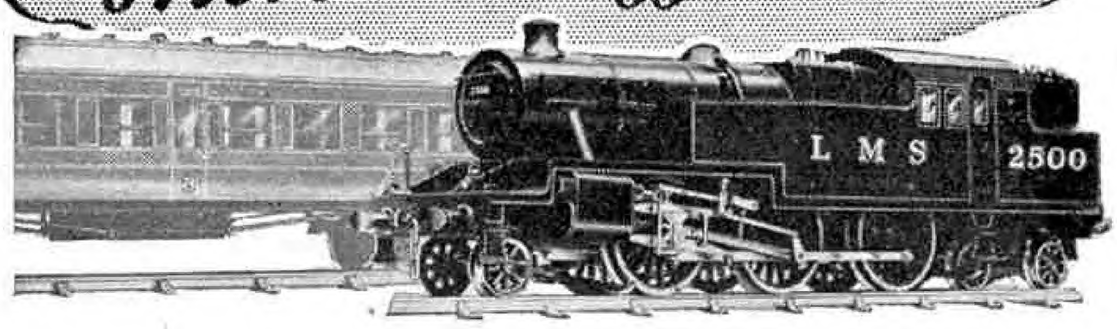
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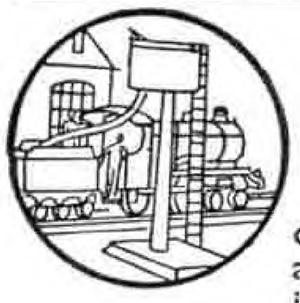
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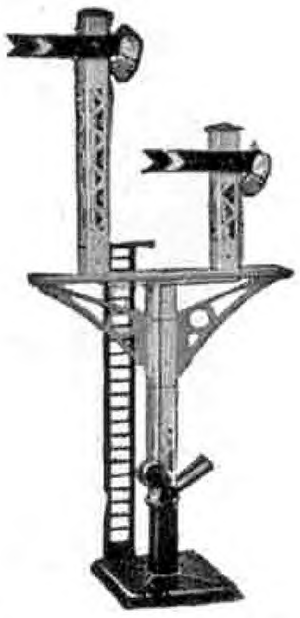
HORNBY ACCESSORIES

There is a splendid range of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway can be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.

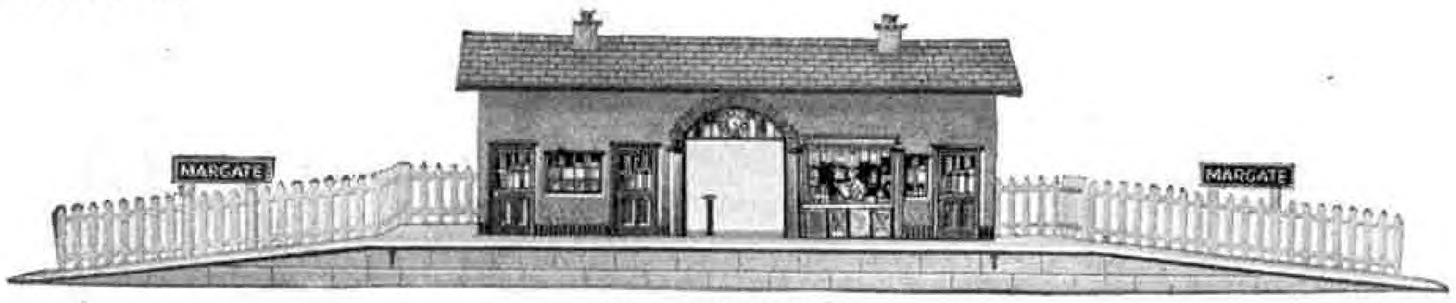


No. 2 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price **2/3**



No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic model. Price **5/-**

GAUGE O



No. 4 STATION
Built up with three detachable sections. Named "Margate," "Wembley," "Ripon" or "Reading." Strikingly coloured, with accessible Booking Hall and Ticket Office Barrier ... ... Price **10/6**

No. 4E STATION
This Station is fitted for electric lighting, otherwise it is the same as No. 4 Station ... ... Price **11/9**



No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price **4/3**



No. 1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever
Price **2/6**



TELEGRAPH POLES
Price per pair **3/-**

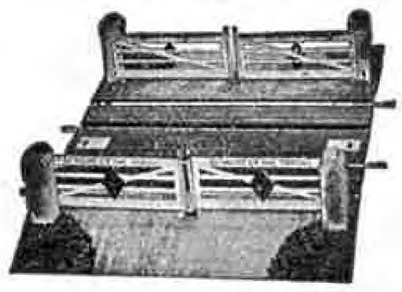


No. 2 LAMP STANDARD
Price **3/9**

GRAPHITE GREASE
For Springs.
Price per tube **6d.**

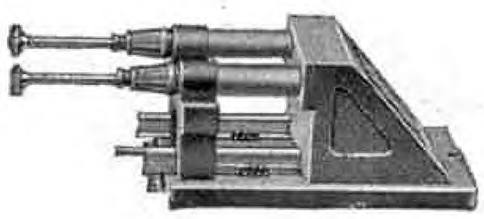


MANSELL WHEELS
These solid die-cast Wheels can be fitted to Hornby Coaches, Vans, etc.
Price per pair **3d.**



No. 2 LEVEL CROSSING
Measures 13⅞ x 10¼ in., with two tracks of gauge O rails in position.
Price **5/3**

No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks.
Price **7/3**

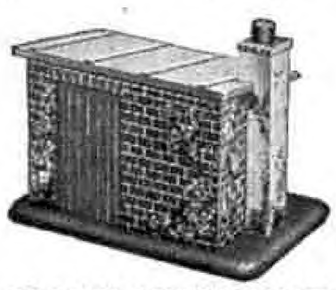


No. 2A BUFFER STOPS
Hydraulic type. Price **2/9**

No. 3A BUFFER STOPS
Similar in design to No. 2A Buffer Stops, but fitted for use with Hornby Solid Steel Track. Price **3/6**



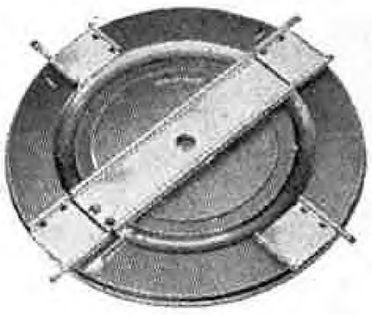
No. 1 SIGNAL CABIN
Finished in colours.
Price **2/6**



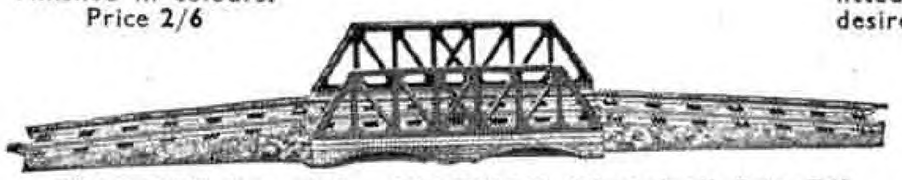
PLATELAYER'S HUT
Price **1/2**



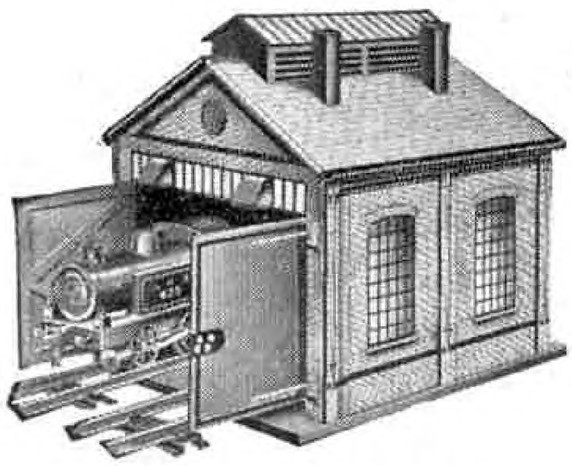
No. 2 SIGNAL CABIN
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price **3/6**



No. 1 TURNTABLE
Price **1/11**



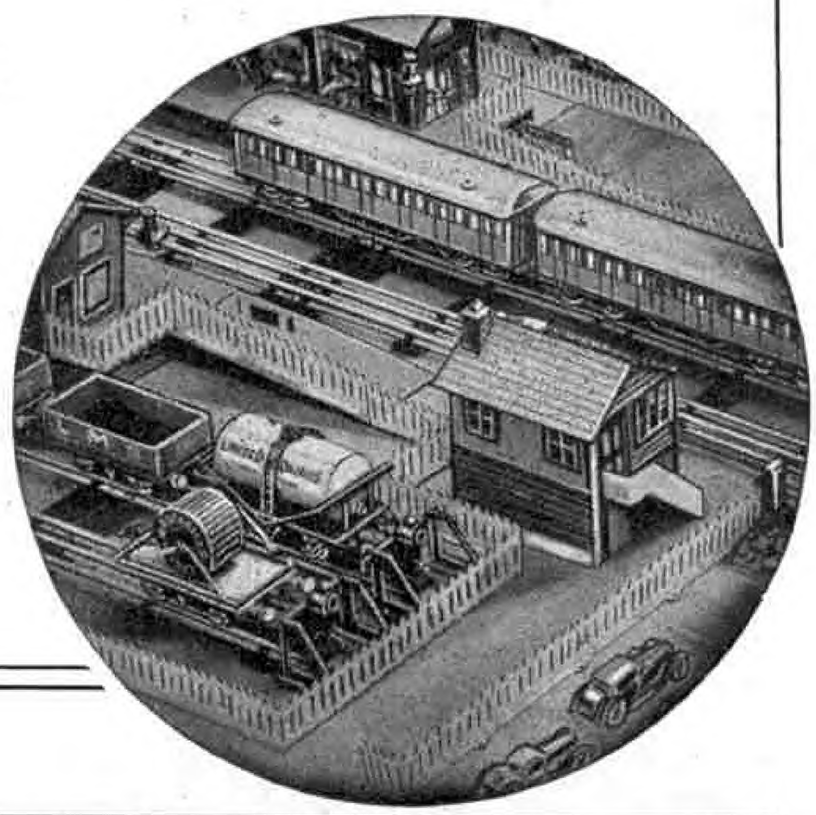
VIADUCT Price **6/9** **VIADUCT (Electrical)** Price **7/6**
VIADUCT Centre Section only ... ... Price **4/6**
VIADUCT (Electrical) Centre Section only ... Price **5/-**



No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price **15/6**



No. 3 STATION
Length 16¾ In., width 6 in., height 6 in. ... ... Price **5/9**



MECCANO LTD., LIVERPOOL 13

HORNBY ACCESSORIES





PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price 3/6



M STATION SET (7 pieces). Price 2/9 complete.
The components of the M Station Set may be purchased separately.
M Signal Box. Price 4d. M Signal. Price 3d. M Station. Price 1/-.
M Telegraph Pole No. 1. Price 3d. M Wayside Station. Price 8d.



No. 1E LAMP STANDARD ELECTRICAL
(Single, as illustrated.)
Price 2/9

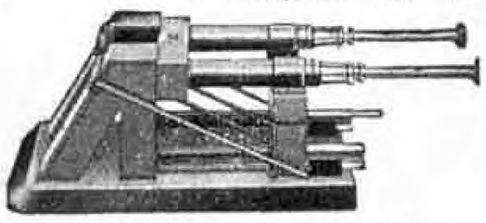
No. 2E LAMP STANDARD ELECTRICAL
(Double.)
Price 3/3



No. 1 SIGNAL DOUBLE ARM
Price 1/3



STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price 3d.



No. 2 BUFFER STOPS
(Hydraulic type.) Price 4/11



LOADING GAUGE
(Illustrated.)
Price 1/11

M LOADING GAUGE
Price 10d.

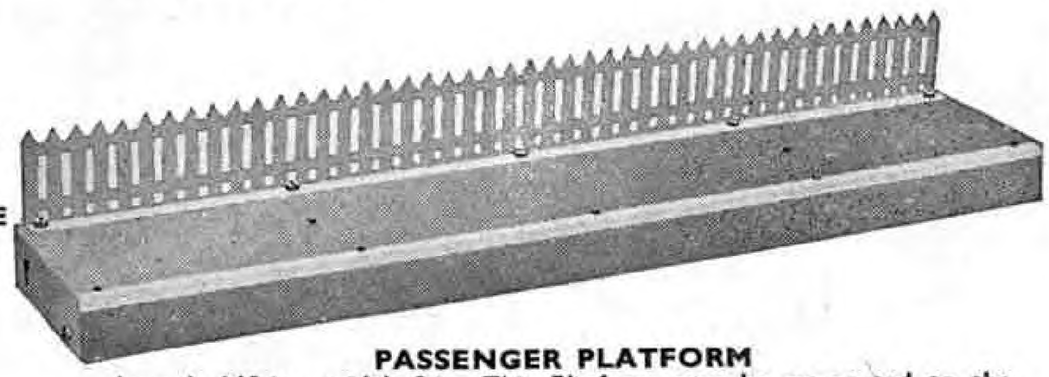
TUNNEL ENDS
Tunnels of varying lengths can be made with cardboard or other material, and then completed with the Tunnel Ends.
Price, per pair, 1/6



No. 1A FOOTBRIDGE
Complete with Signals. Price 4/6

No. 1 FOOTBRIDGE
Without Signals. Price 2/11

MECCANO LUBRICATING OIL
Price, per bottle, 6d.



PASSENGER PLATFORM
Length 16¾ in., width 3 in. This Platform may be connected to the main Station or used separately. Price 2/-
The white Paled Fencing may be purchased separately. Price, per length, 6d.



No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier, Shovel and Poker. Price 10d.

No. 1 BUFFER STOPS
(Spring type).
Price 1/-

No. 1E BUFFER STOPS
As No. 1, but wired for electric lighting.
Price 1/3



BRICKS FOR No. 2 HIGH CAPACITY WAGON
A realistic load for Hornby Wagons. They are packed in a box, the lid of which fits inside the No. 2 High Capacity L.N.E.R. Brick Wagon to form a base for the load. Price, per box, 10d.

COAL FOR HORNBY WAGONS
Imitation coal for loading into Hornby Wagons. It is packed in a box the lid of which fits inside the L.M.S. and G.W.R. No. 2 High Capacity Wagons to provide a base for the load. Price, per box, 6d.

POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price 6d.
„ 2 Series. Packet of 51 „ 6d.

POSTER BOARDS
Designed to carry Hornby Posters. Provided with lugs for attachment to Paled Fencing, etc.
Packet of 6 (3 large and 3 small).
Price 4d.



No. 2 OILCAN
("K" Type.) The oil is ejected drop by drop by depressing the valve. Polished copper. Price 3/6



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Price 4/-

DIE-CAST SPOKED WHEELS
As fitted to Hornby Wagons, etc.
Price, per pair, 3d.



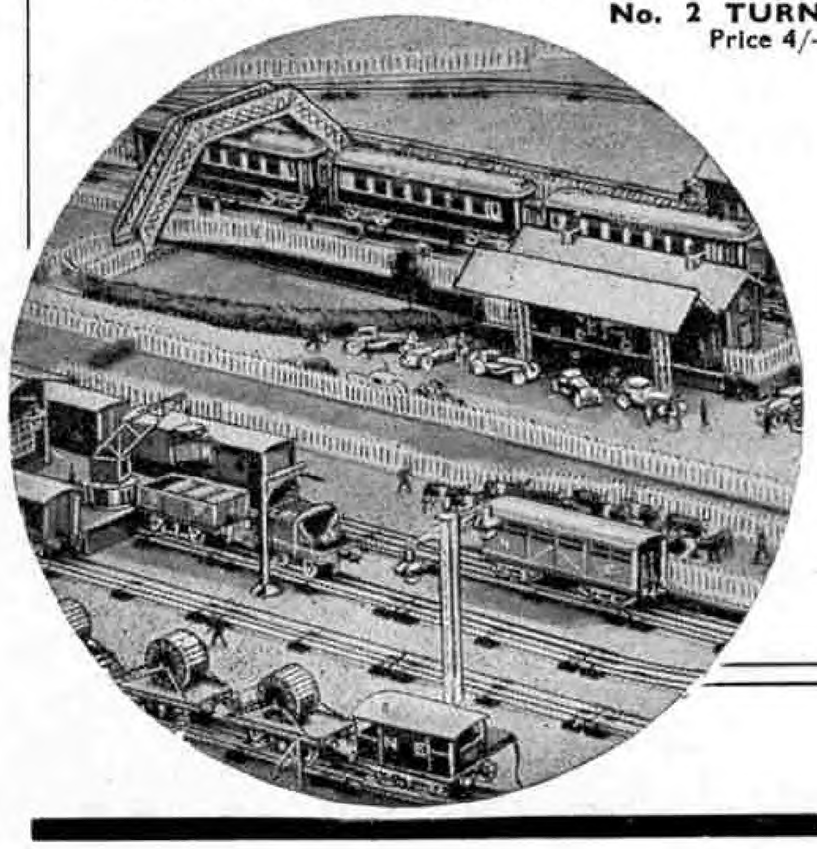
No. 1 OILCAN
Price 6d.



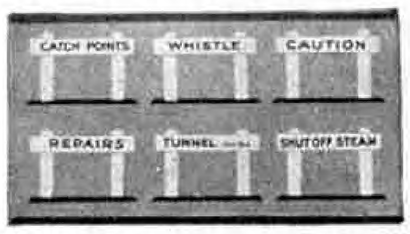
M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price 1/-



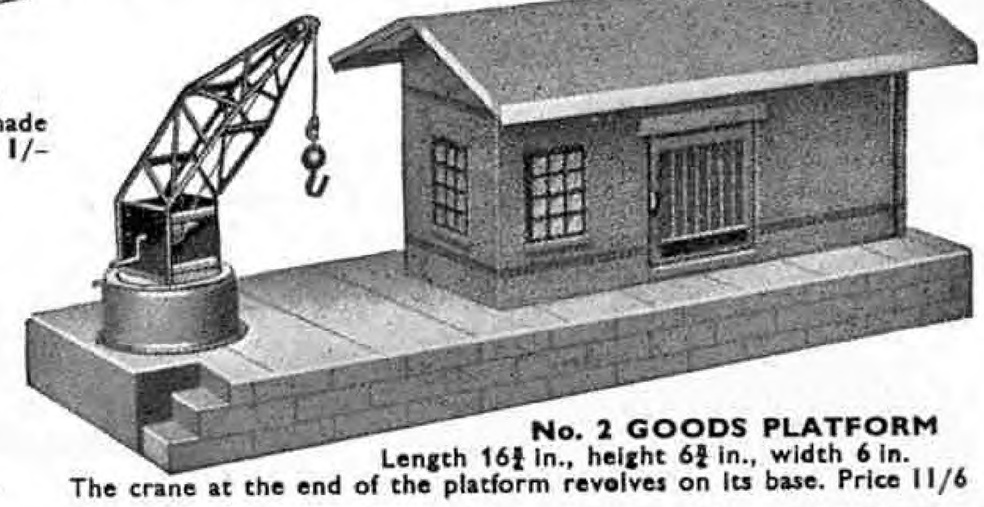
ISLAND PLATFORM
Length 32½ in., height 6¾ in., width 3 in. Price 6/3
The ramps may be purchased separately. Price, per pair, 1/9



No. 8 RAILWAY ACCESSORIES



Notice Boards. Price 2/-



No. 2 GOODS PLATFORM
Length 16¾ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price 11/6

MECCANO LTD., LIVERPOOL 13

TRI-ANG

MINIC MODELS

REGD.

ROAD TRANSPORT TRUE TO SCALE

Here's a fascinating new hobby, collecting real true-to-scale models of every form of road transport, with perfect replicas of garages, petrol stations, etc. If you are already a model railway enthusiast become a transport enthusiast as well—or start with a hobby by becoming a model transport collector. Almost every type of road transport is represented. Each model is strongly constructed and fitted with long running mechanism and some are even fitted with electric lights.



MINIC £100 Saloon
LENGTH 3⅜ ins.
Price **6d.**



MINIC Tip Lorry
Price **1/3**
LENGTH 5½ ins.



L.B.L.Ltd MINIC DAIMLER SEDANCA

LENGTH 5¼ ins.
With Electric Light and Battery **3/6**
Without Electric Light **2/6**



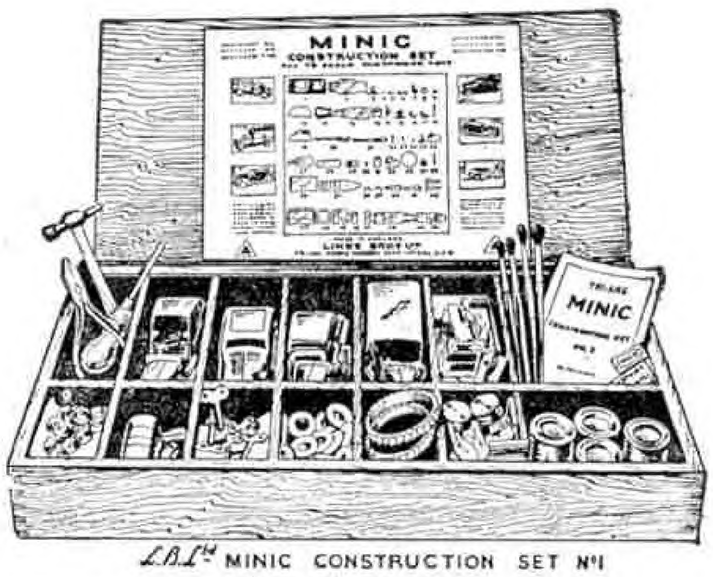
MINIC Traffic Control Car
LENGTH 5 ins. Price **1/6**



MINIC Breakdown Lorry
with Mechanical Crane.
LENGTH 5½ ins. Price **3/6**

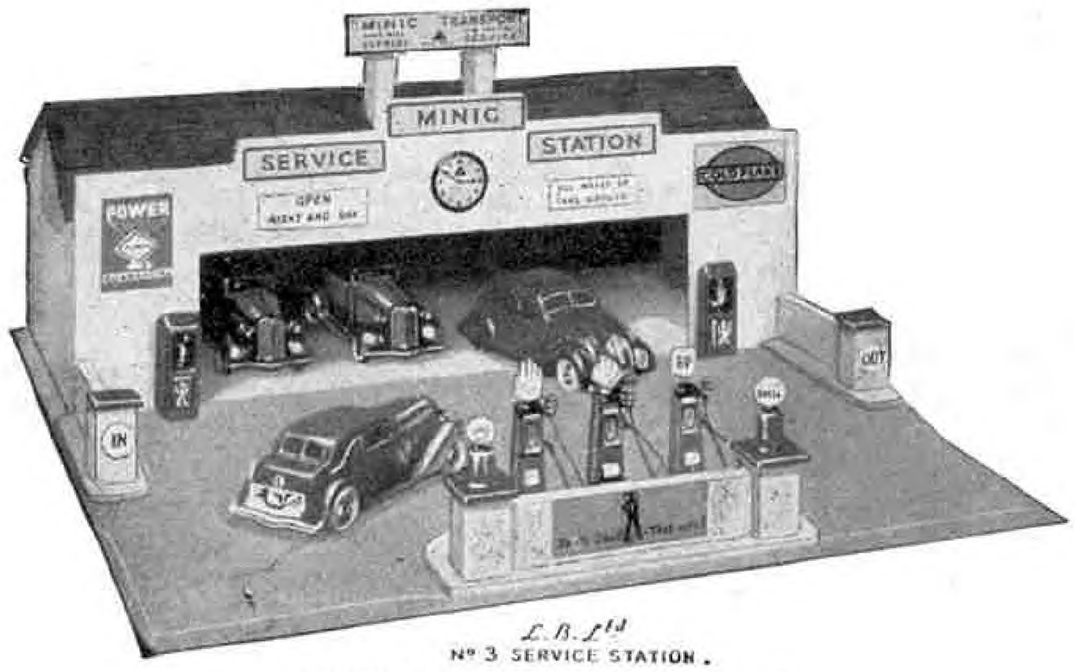


MINIC Searchlight Lorry
with Electric Searchlight and Battery.
LENGTH 5¼ ins. Price **3/6**



L.B.L.Ltd MINIC CONSTRUCTION SET N°1

MINIC Construction Set No. 1
A complete set of parts for making six types of MINIC all to scale clockwork models. All parts, including powerful clockwork motor units, are made with precision tools and machines. Full instructions and tools are included in each set which is packed in a handsome oak finished cabinet 18 ins. x 9¾ ins. x 2½ ins. Price **15/-**



L.B.Ltd N° 3 SERVICE STATION.

MINIC Service Station No. 3
Realistic design, imitation red tiled roof with sign, three large petrol pumps, one large oil cabinet, two electric lights and battery, dummy clock face and other signs. LENGTH 16 ins. Price **9/11**
CARS NOT INCLUDED.

All good Toy Shops and Stores stock MINIC MODELS. Call and see the large range.

L. BROS. LTD. LONDON BR OS ENGLAND

TRI-ANG

ASK YOUR DEALER FOR THE COLOURED TRI-ANG TOY LEAFLET

MADE IN ENGLAND BY

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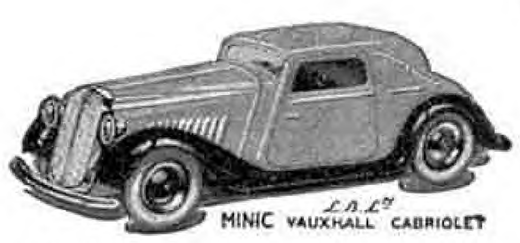
TRI-ANG WORKS LONDON S.W.19



MINIC Taxi
LENGTH 4¼ ins. Price **2/-**



LENGTH 5 ins. Price **1/-**



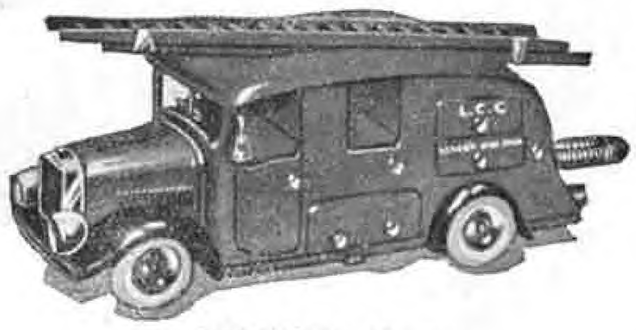
LENGTH 5 ins. Price **1/-**



MINIC Daimler Sunshine Saloon
with Electric Headlamps and Battery.
LENGTH 5¼ ins. Price **3/6**
Without Electric Lights **2/6**



MINIC Lorry with cases
LENGTH 5½ ins. Price **1/6**

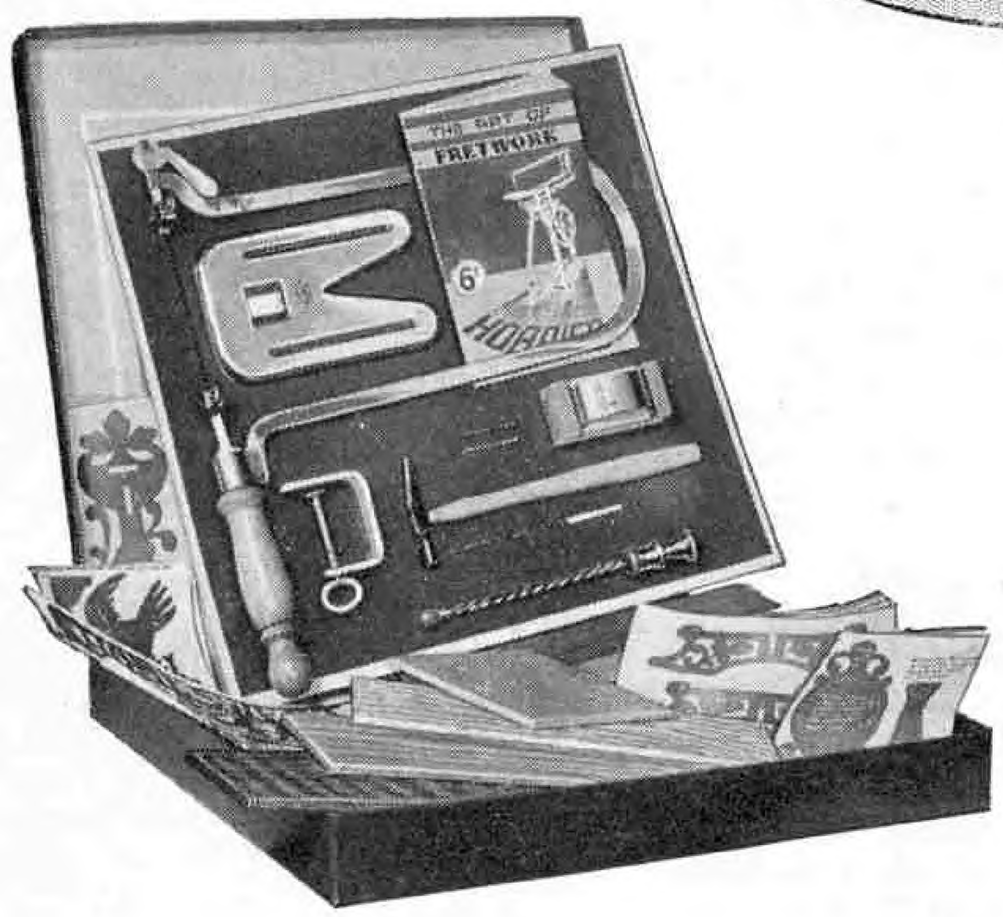


MINIC Fire Engine
with Electric Headlamps and Battery.
LENGTH 6¼ ins. Price **5/-**

FRETWORK OUTFITS

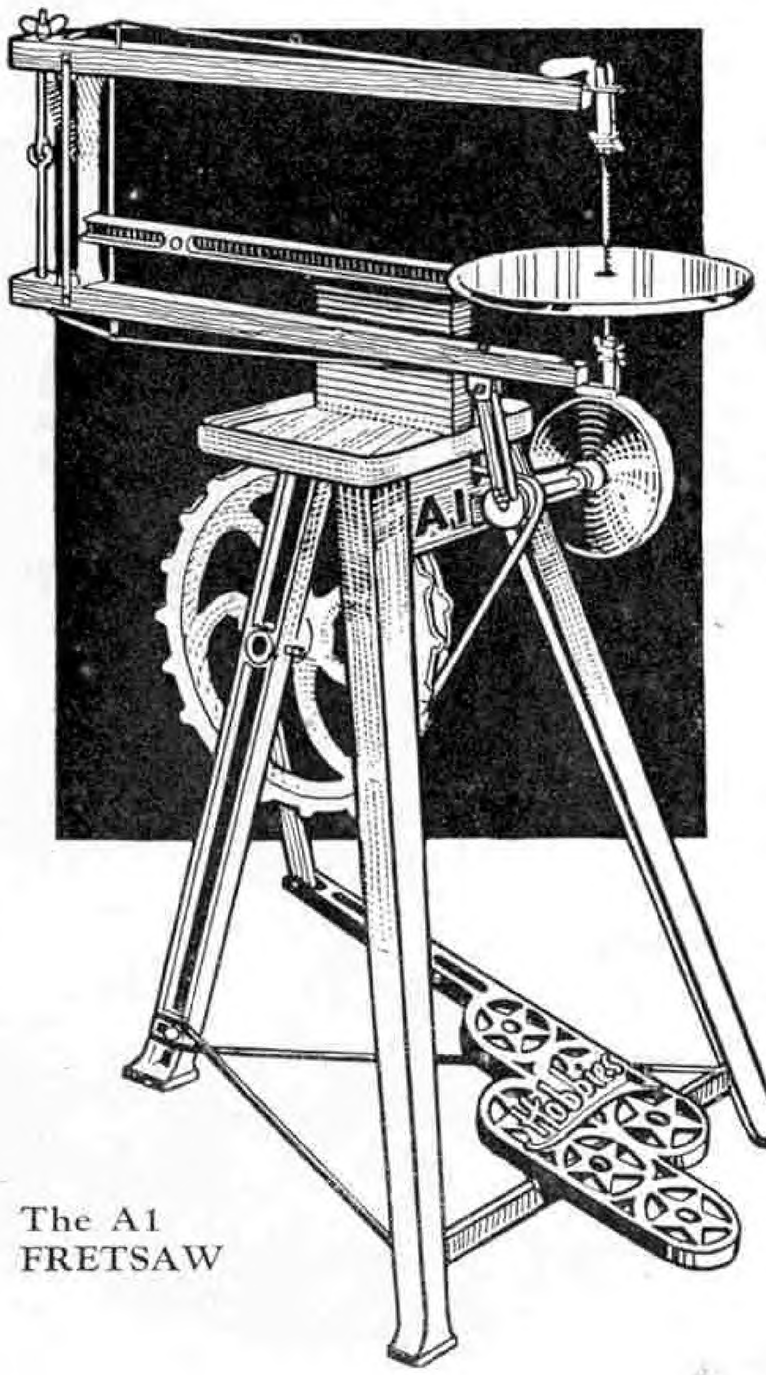
Hobbies

TREADLE FRETSAWS



Why not spend your spare time profitably at making things for the home, or to use, or even models in wood. You can easily cut out toys, or trays, tables or boxes, models of ships, locomotives, galleons, etc., from simple patterns and instructions provided. A Hobbies Outfit contains all necessary tools and you can begin right away. Designs are given every week in Hobbies (price 2d.) or the Hobbies Handbook (284 pages, price 6d.) shows over 500 things to make. Any Hobbies Outfit makes an ideal present.

Fretwork cuts out dull evenings



The A1
FRETSAW

The A1 OUTFIT

A popular complete set of tools in strong box. Including 14 in. lever handframe, archimedean drill with two bits, cutting table with cramp, one dozen sawblades, a small but useful fretwork hammer, glasspaper block, 64-page illustrated handbook of clear instructions for beginners, and simple fretwork designs with sufficient planed fretwood for making six useful articles.

72/6

(Post 9d. extra)

The A1 MACHINE

Provides veritable factory at home. Doubles your output and halves your labour. A rigid well made machine, easy running and capable of taking work up to 19 ins. long. Easy tensioning device. Supplied ready to use, with handbook of instructions, spare sawblades and simple design.

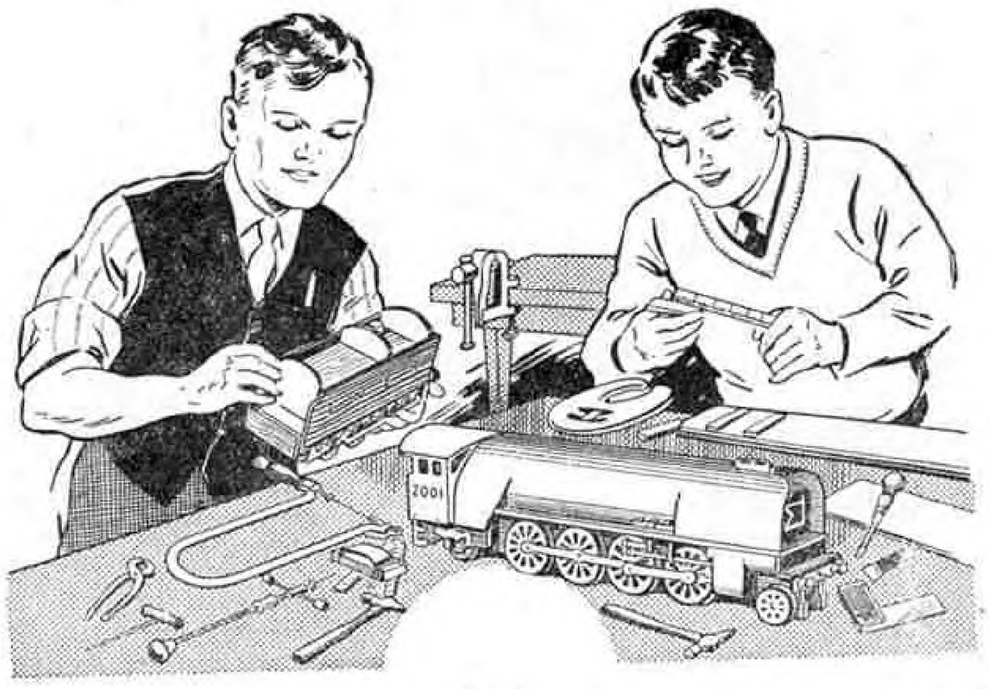
52/6

(Car. Forward)

FREE

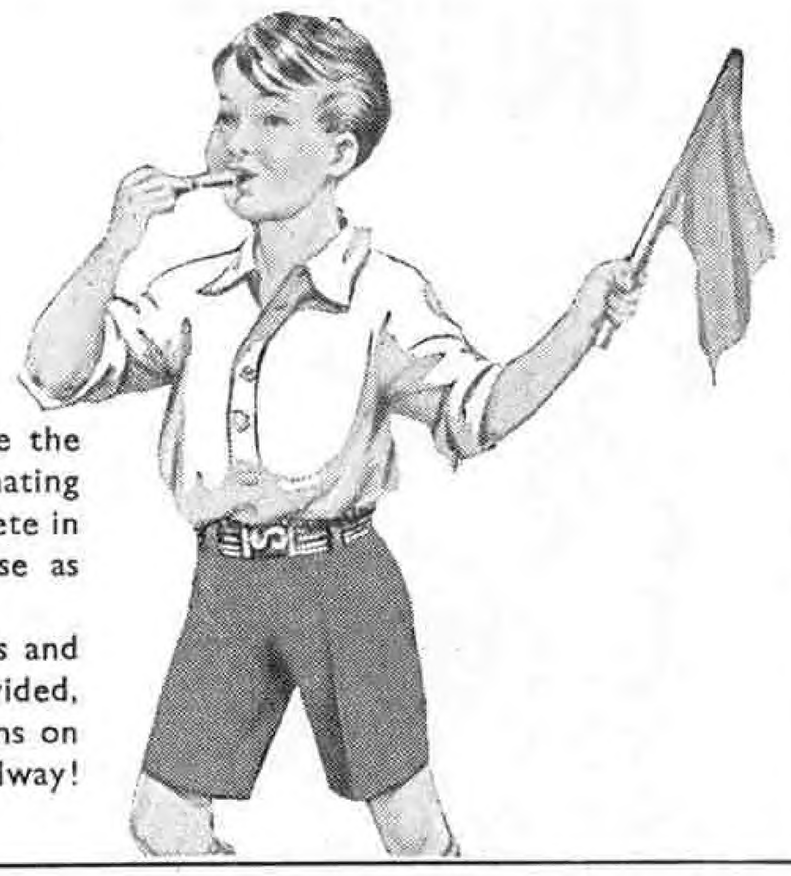
Write for free coloured leaflet of prices and all outfits to Dept. 96, Hobbies Ltd., Dereham, Norfolk.

At all leading Stores, Ironmongers, Bazaars, and Toyshops. Or Hobbies Branches in London, Glasgow, Manchester, Birmingham, Sheffield, Leeds, Southampton, Hull. Or direct from Hobbies Ltd., Dereham, Norfolk.



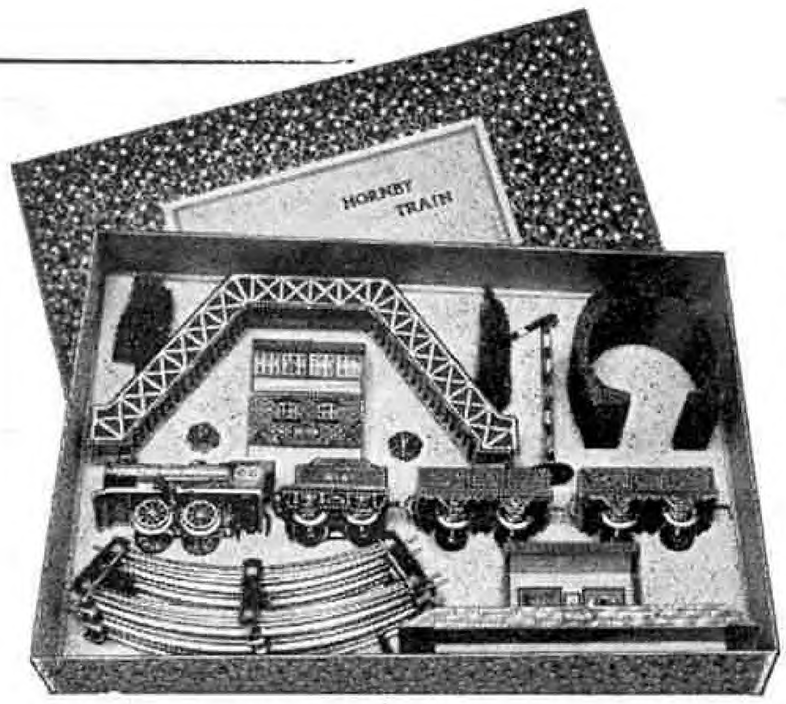
COMPLETE MODEL RAILWAY SETS

Right away for Happy Days!



These fine Model Railway Sets provide the simplest way of beginning the fascinating Hornby Railway hobby. Each Set is complete in itself; everything is there, ready for use as soon as you get it home.

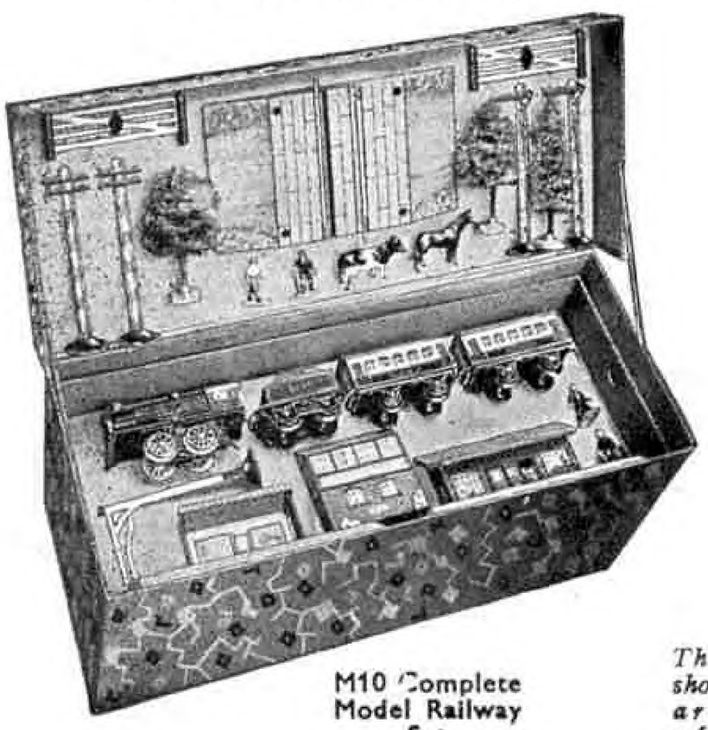
Unpack the box, then lay out the rails and accessories as shown in the illustration provided, put the locomotive and coaches or wagons on the track, and begin to run your own railway! It's the greatest fun in the world!



M8 Complete Model Railway Set



M9 Complete Model Railway Set



M10 Complete Model Railway Set

M8 Complete Model Railway

Consists of a fine non-reversing Locomotive that can be braked from the track, Tender, two Goods Wagons and Set of Rails; Wayside Station, Footbridge, a Signal and Signal Cabin, two Trees with Stands, and Tunnel. Packed in a strong carton as illustrated. Price 9/11

M9 Complete Model Railway

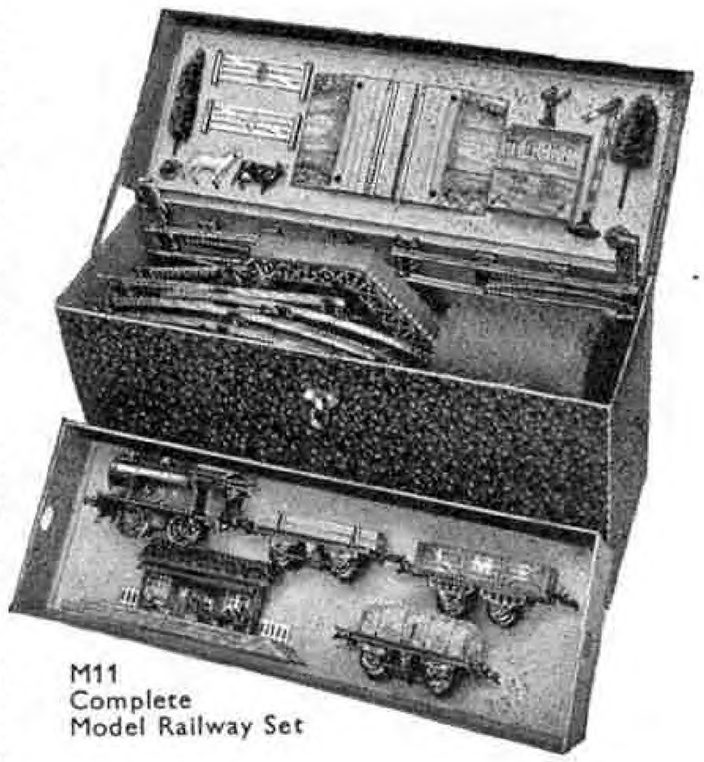
This Set includes a non-reversing Locomotive that can be braked from the track, Tender, two Passenger Coaches and Set of Rails; Station, Footbridge, Signal and Signal Cabin, Level Crossing, Guard, Porter, two Trees with Stands and two Hikers. Packed in a strong carton as illustrated. Price 12/6

M10 Complete Model Railway

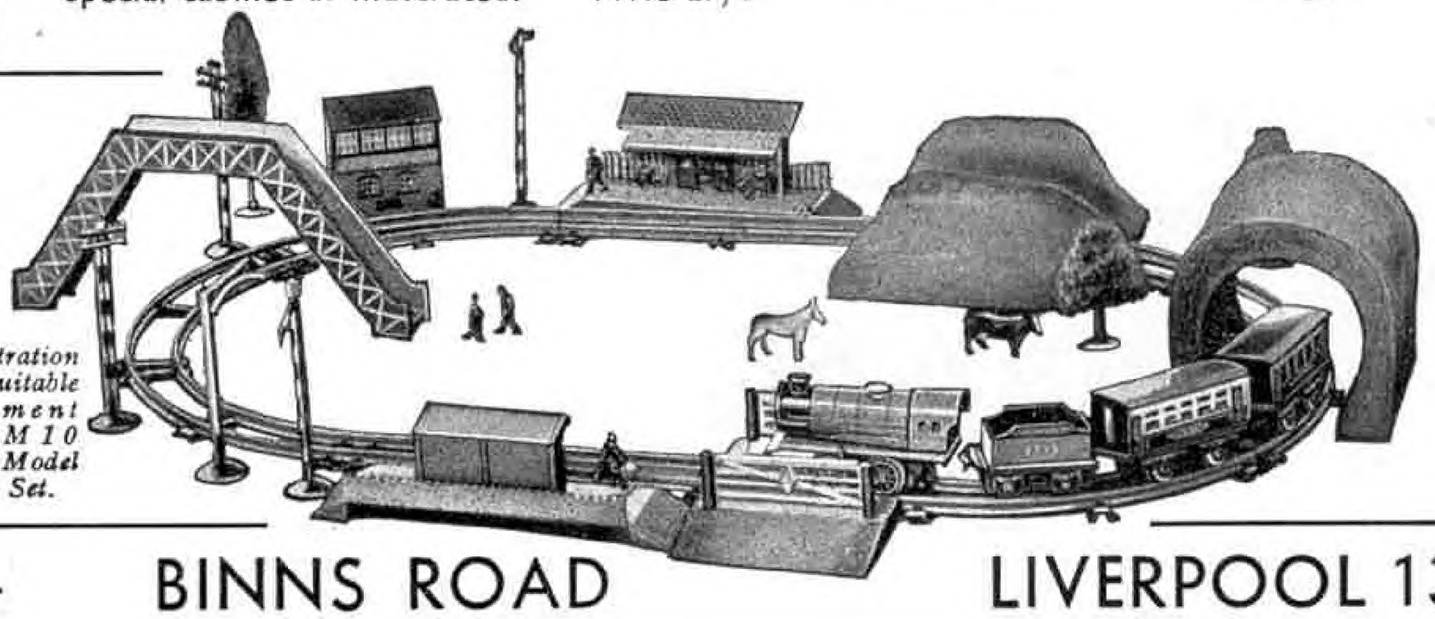
A larger Set containing a non-reversing Locomotive that can be braked from the track, Tender, two Pullman Coaches and Set of Rails; Footbridge, two Stations, Signal Cabin and two Signals, two Telegraph Poles, Loading Gauge, Tunnel, Cutting, Level Crossing, three Trees with Stands, two Porters, two Hikers, Horse and Cow. The Set is packed in an attractive special cabinet as illustrated. Price 19/9

M11 Complete Model Railway

This is the largest and best of the Complete Model Railway Sets. It includes a powerful reversing Tank Locomotive that can be braked from the track, Fibre Wagon, Timber Wagon, Open Wagon and Set of Rails and Points; Tunnel, Station, Signal and Signal Cabin, Level Crossing, Footbridge, two Trees with Stands, Guard, one Cow and one Horse. The Set is packed in a strong special cabinet as illustrated. Price 27/6



M11 Complete Model Railway Set



This illustration shows a suitable arrangement of the M10 Complete Model Railway Set.

MECCANO LIMITED — BINNS ROAD LIVERPOOL 13

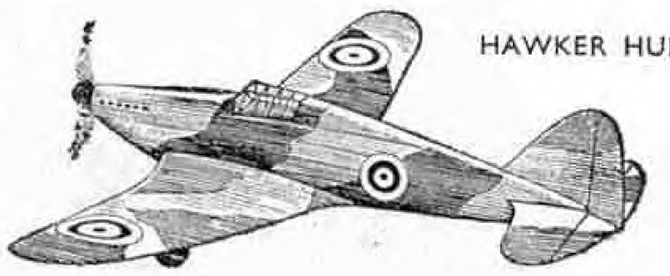
Start this hobby — FROG experts will help you



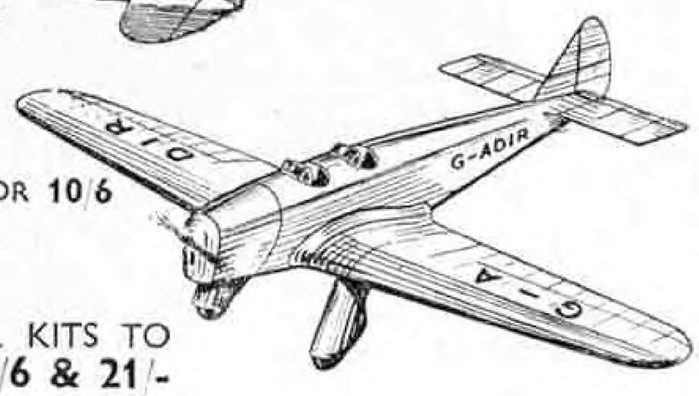
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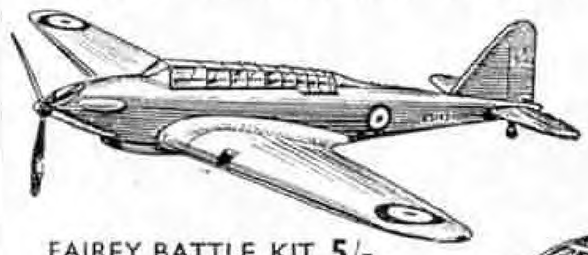


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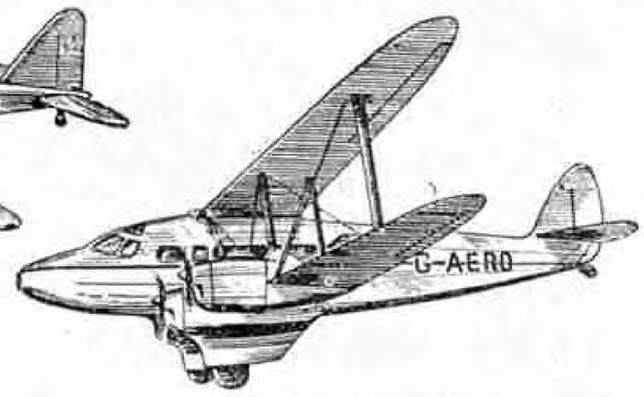
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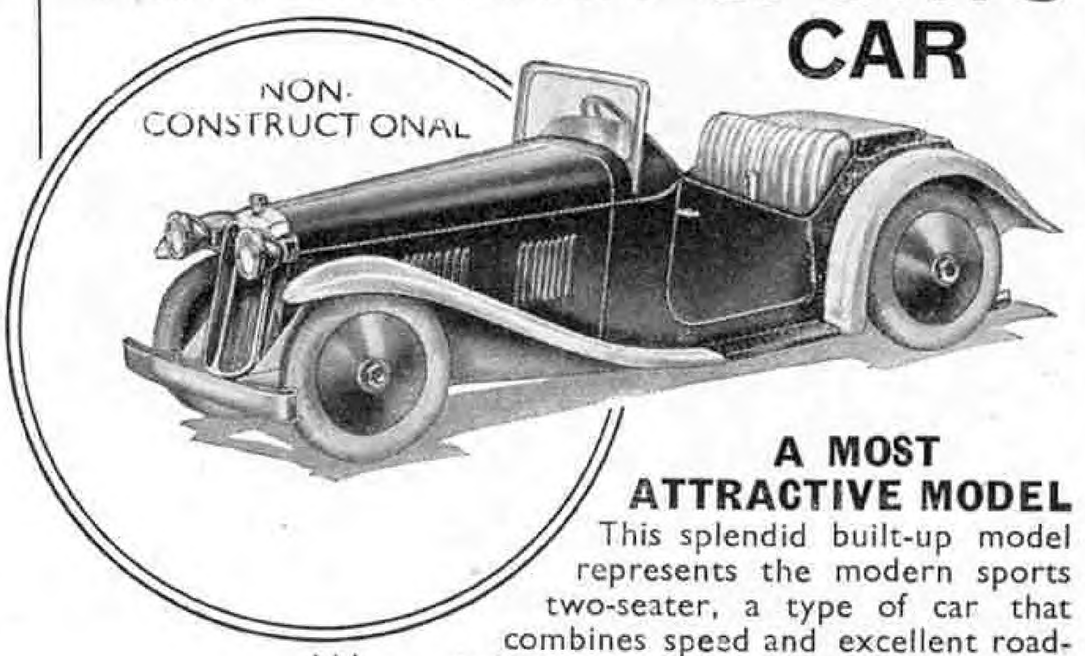
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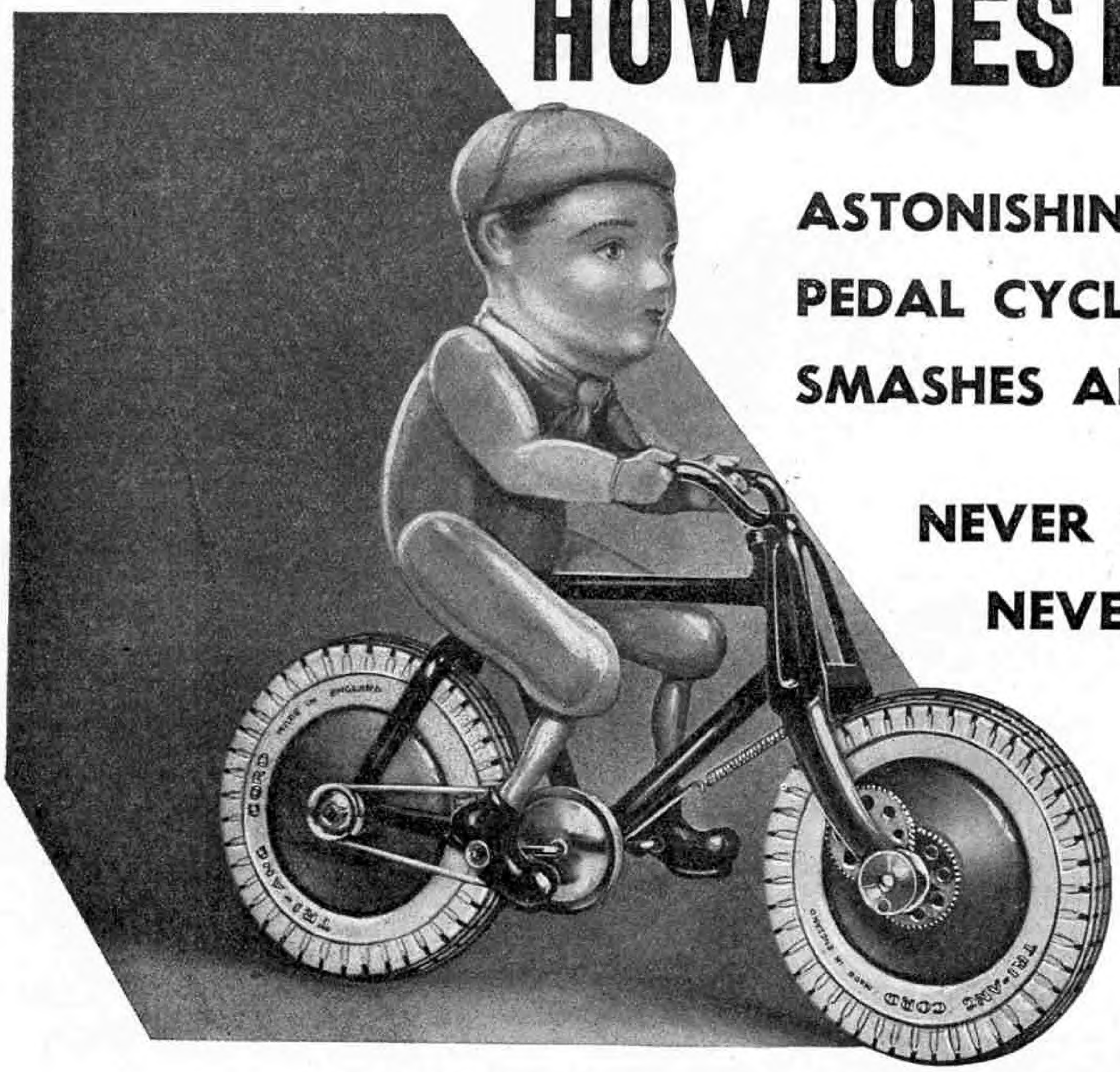
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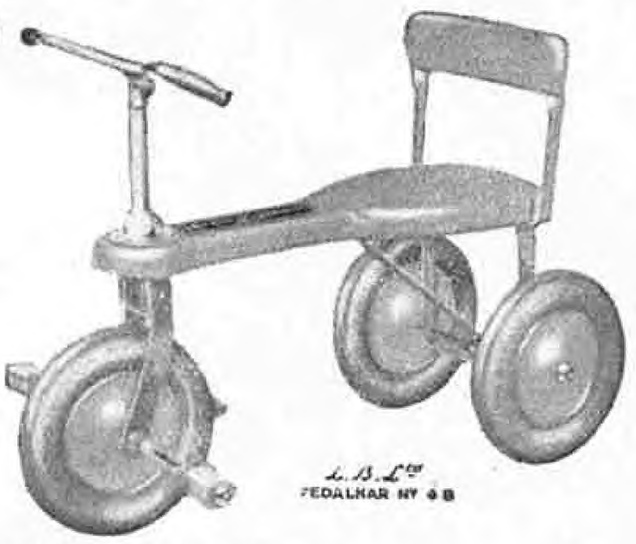
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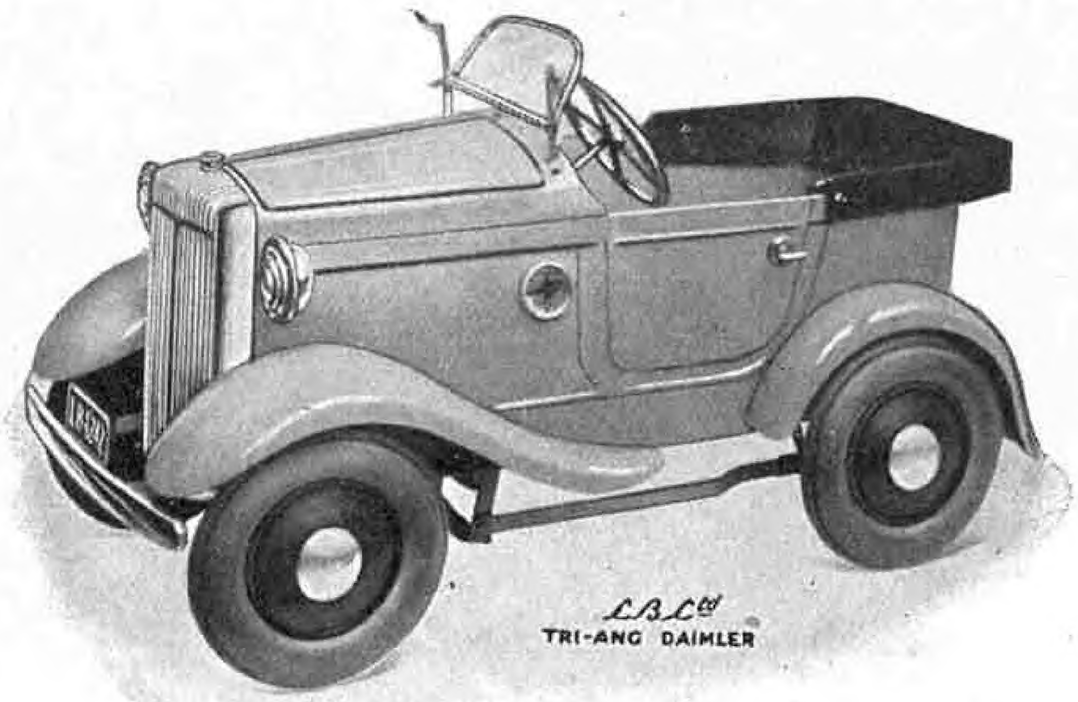
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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
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Vol. XXIII. No. 12
December 1938

With the Editor

Getting Value for Money

It is a curious fact that many people who would not dream of anything even approaching sharp practice in connection with individuals or small businesses take a real delight in getting a little more than they are entitled to from big concerns such as the railway companies. Whenever the railways announce a concession of any kind certain people always set to work to try to get more out of the concession than was intended. An amusing instance of this has cropped up in connection with the special weekly tickets that allow the holder to travel as often as he likes within a certain area. The "*Railway Gazette*" draws attention to the way in which, with these tickets, whole families can travel to the seaside by instalments. The idea is for each individual, on arrival at his destination, to post home his ticket to be used by the next on the list. The tickets of course are "not transferable," but it is extremely difficult for the railway people to prevent misuse. Some time ago the "*Yorkshire Post*" burst forth into song on this subject as follows:

"Mother goes on Monday with the dog
and little Gert.,
And sends the tickets back again for
Dad and brother Bert;
Dad then posts them home again for
me and Auntie Nell,
Oh, aren't these lovely tickets, that
the railway companies sell."

High-Speed Air Travel

High-speed luxury air travel makes another step forward with the coming of the Imperial Airways liner "*Frobisher*." This liner and subsequent craft of the same "F" class will be capable of carrying passengers from London to Paris in 64 minutes, to Cologne in 91 minutes, to Zurich in 153 minutes and to Budapest in 277 minutes. The liner can take off and climb to 14,100 ft. on only three of its four engines, and can maintain a height of 5,100 ft. with only two engines operating.

Some time ago a speaker on the radio forecast the time, not very far distant, when air liners will cross the Atlantic at a speed of some 350 m.p.h. It does not seem to me that he was too optimistic, and it is interesting to note that the Eire authorities seem convinced that regular transatlantic flying is close at hand. The air base they are constructing at Foynes on the Shannon will be a remarkable engineering achievement. It will combine the best features of a marine airport and an aerodrome for landplanes with hotel and other accommodation, and a powerful light beam to guide ocean-going aircraft approaching the Irish coast at night.

The Editor
and all his staff wish every reader
a very
Merry Christmas

"Casey" Jones

In the "*Illinois Central Magazine*" I read of the unveiling of a monument to a former Illinois Central engineman, John Luther Jones, better known as "Casey" Jones, from the name of the town, Cayce, where he once lived. Casey Jones has become famous by reason of his heroism in a collision that occurred in 1900.

Casey Jones joined the Illinois Central Railroad in 1888 as a fireman, and in less than two years was promoted to engineer or engine driver. In 1900 he began to make the run between Memphis, Tennessee, and Canton, Missouri. On reaching Memphis one evening at the end of a trip he and his fireman found that they had to make the return journey, as the scheduled driver had reported sick and no other driver was available. Unfortunately a freight train ahead of them, which was being refuged in a loop alongside the single main line, turned out to be too long to fit in the siding. Jones saw the danger, warned his fireman to jump, and did everything possible to check the speed of his train. So successful were his efforts that, although he was killed in the crash and was found still clutching the brake handle, there were no other casualties. The fireman is still alive, and was present at the unveiling ceremony.

Christmas in Finland

A Land of Quaint Festivities and Customs

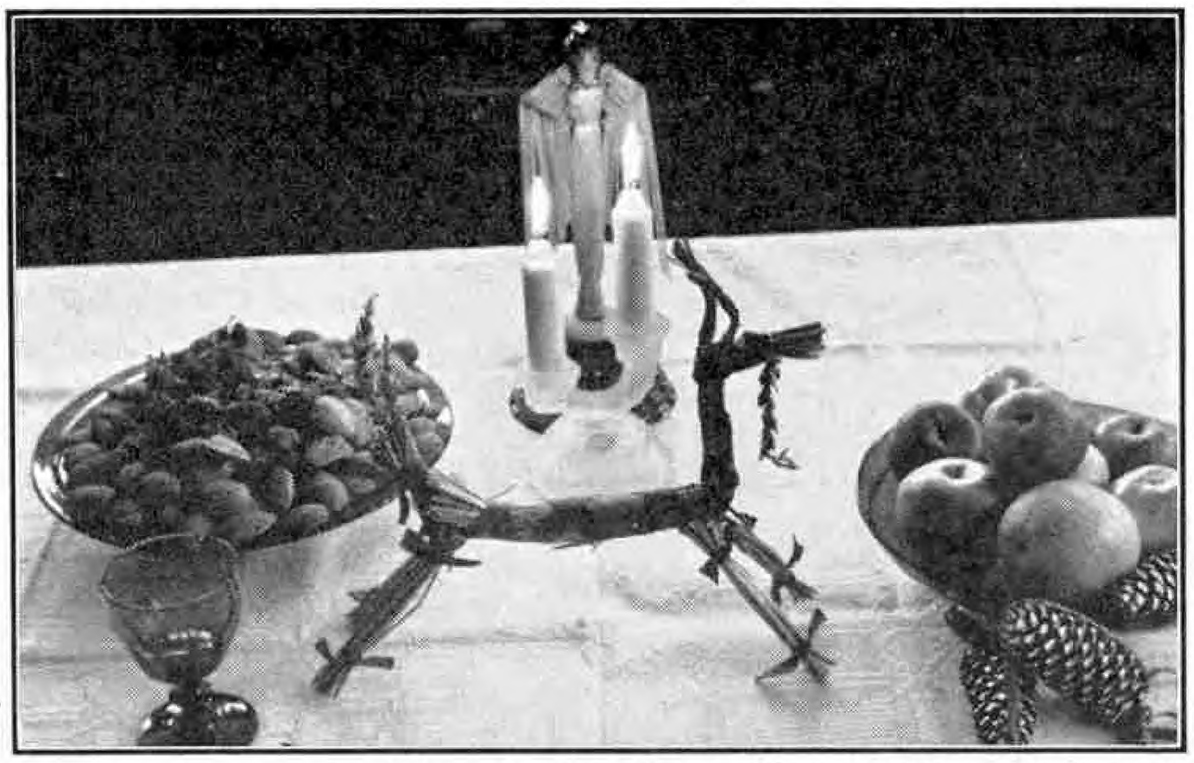
By M. A. Savonius

IT may seem strange to celebrate Christmas twice, but this is what they always do in Finland. First of all comes the "Little Christmas," as the Finns call it, but it is not taken very seriously. The festivities associated with it begin about three weeks before Christmas Day, and a lot of people give each other presents. But I am afraid they are not very exciting ones, as they usually take the form of gentle reminders of the recipient's bad habits during the past year. For instance, if you have a friend whose socks are always falling down, you give him a pair of suspenders. You may know someone who sniffs continuously; well, here is your opportunity to show your disapproval by giving him the largest and gaudiest handkerchief you can buy. These presents for "Little Christmas" often take the form of miniature representations. Thus if you have a friend who is keen on motor cycles you would give him a little model of one made in lead or perhaps chocolate.



Bringing nome the Christmas tree. The forests of Finland are full of fir trees, but even so it is not always easy to find one that is the right size and perfectly even in shape.

In this land of pines and firs of course everyone has a Christmas tree, and one of the first things you do when you go out into the country for your holidays is to look for a suitable tree in the neighbouring forest. There are thousands of trees everywhere, but you would be surprised how difficult it is to find one the exact shape and height you want to fit into the living room. At last the decision is made, and the eldest son has the honour of chopping down the chosen tree while the admiring family stands round watching him. Just as we in this country drag home the Yule log, so in Finland the Christmas tree is brought in with great ceremony.



The Christmas goat, made of straw and tied with red ribbon, which forms an important part of the Finnish Christmas decorations.

Certain conventional things are always hung on the Christmas tree as decoration, such as the rosiest apples saved from the Autumn harvest, and lots of specially baked ginger bread "stars," the Christmas goat about which I shall tell you later, and little fat sucking pigs.

On 13th December you will be awakened very early in the morning by the prettiest daughter in the house, with the longest fair tresses. It will probably give you a shock if you do not know anything about the Finns' customs at this time of the year, as she will arrive at your bedroom door dressed as St. Lucia. They did not tell me about this when I was living out there, and so you can imagine my surprise when in walked the eldest daughter of the family, wearing a wreath of whortleberry leaves and a halo of lighted candles in her hair. I knew then why I had been solemnly packed off to bed so early the night before, as the fixing of the candles into the wreath must have been a long and difficult job. Handing me a tiny cup of black coffee and a slice of "bulla," a kind of Finnish cake, she announced in majestic tones that she was the "Spirit of Christmas," offering me the good things of the house for the coming festival.

The festivities really begin with "Dipping Day," when a large ham is boiled in a special copper pan. This is used for washing clothes during the rest of the year, but nobody minds and it is jolly good fun dipping your hard pieces of rye bread in the hot fat, which helps to keep out the cold.

Some families prefer to smoke their Christmas ham, and this is where the famous Finnish bath house comes in useful. I have watched the most agile youngster of the neighbouring family climb up on to the roof of the house, lugging the whole ham with him. When he had got his breath again he began to lower it half way down the chimney. All the while father down below was heaping sawdust and fresh juniper branches on the blazing log fire in the bath house to make as much smoke as possible to cook, or rather cure the ham, and by the time my young friend climbed down again he looked more like a negro than a Finn.

Christmas Eve is THE day in Finland though, as the big Christmas dinner is eaten then. But I am afraid that if you are as fond of your Christmas turkey as I am you would be bitterly disappointed, for instead of it you are given a plate of peculiar half-cooked fish that has been treated with wood ashes for several weeks previously. The Finns love it, but frankly I consider it bad! Instead of plum pudding you get a thick rice porridge that somehow I don't think English school boys would approve of at all, but of course if you like ham there is plenty of this on the table.

You get all your Christmas presents after dinner before you go to bed. There is usually no Father Christmas as we know him in England. Instead the Christmas Goat is supposed to bring the presents. No dinner table is complete without a model of this animal, which the children make out of straw and decorate with brilliant scarlet ribbons. Some idea of what he looks like is given by the lower illustration on the previous page.

On this special evening the little house gnome, who is believed to bring good luck to the house, is never forgotten, and a plate full of porridge is put out on the door step for him. Of course it is all gone in the morning, but I never dare to venture the opinion that birds get very hungry in Winter!

We are all up before six o'clock the following morning, but someone has been up long before we had awakened, and has gone round the house placing in every window a lighted candle specially moulded with three wicks to symbolise the Holy Trinity.

While we strap on our skies the family sledge is harnessed, and all of us are in a tremendous bustle so that we won't be late for church. It is still pitch dark as we glide off across the white carpet at our feet, but now and then we catch a glimpse of candles twinkling in other cottage windows between white-mantled trees, which stand like guardian sentinels round every house in this part of the world.

The horses' hoofs biting into the crisp snow, jingling sledge bells and creaking harness sound very romantic as the rest of the family overtake us, and the sledge starts climbing the little hill that leads to the village church. We greet all our friends with *"Glad Jul,"* which means Happy Christmas, as we enter the quaint old church, inside which it is dazzlingly bright after the darkness outside. A large Christmas tree stands on each side of the altar, and the church is a blaze of candle light.

At the end of the service you notice a stir of expectation passing through the congregation as the old white-haired pastor gives his blessing. And no wonder, for as the last words pass his lips every young man whose father owns a sledge makes a rush for the door. This is the signal for the rest of us to crowd into the porch to watch the sledges careering madly down the drive. There are centuries of tradition behind this mad race. It is said that the one to lead the way on the homeward run will be blessed with the tallest field of flax next Summer, and all the competitors race as though they really believed there was some truth in this old legend.

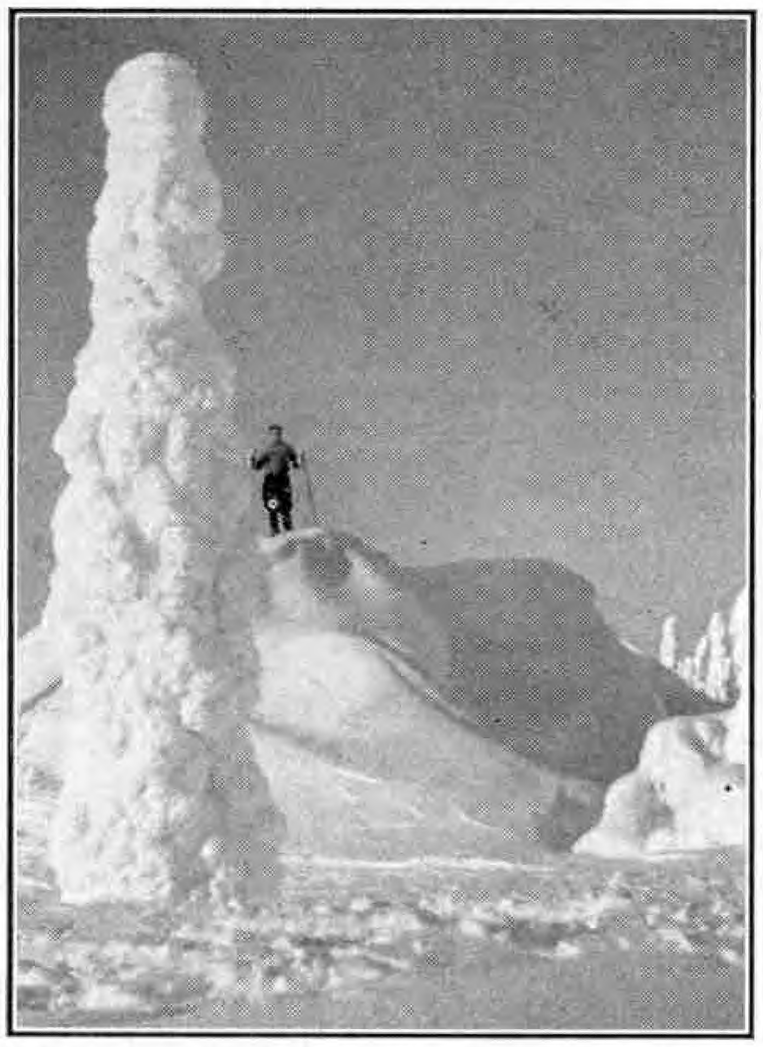


On New Year's Day a large balloon made of coloured tissue paper is filled with hot air over an oil stove out on the ice, and is then let off in the presence of the whole family.

Christmas Day is essentially a family day in Finland and you spend it quietly at home by the fireside reading your new books and the Christmas papers. The younger boys go out to try the skis or new bindings that they have been given, and in the evening everybody gathers round the fireside.

On Boxing Day the round of Christmas parties begins, and the young people—and many older ones too—have a very gay time visiting one house after the other. If the weather is fine sleigh parties are arranged. It is great fun driving along the snowy roads in gay company with about 20 sledge bells jingling in tune through the frosty air.

You go for ski-ing trips too, of course. Sometimes you are out all day and travel for many miles through the silent forests, over hills and across frozen lakes. Many people have little sports huts built far out in the woods, and generally you make for one of these on your trip and spend an hour or two there, eating your sandwiches and resting before starting back again. Just as often, though, the boys and girls do not travel very far, but make a track round the home woods and fields, choosing the most difficult places. Then they spend their time ski-ing round and round this track and getting really used to all the hills and turns, so that eventually they can do it in record time without a single fall.



This is a tree, this was! The Finnish winter is cold, and trees are frozen into solid pillars.

Building small ski jumps and bobsleigh tracks down steep hills are other Christmas holiday occupations. If the ice is in suitable condition you will find crowds of young people skating or playing ice hockey, and some very daring fellows may even be sailing about in an ice yacht.

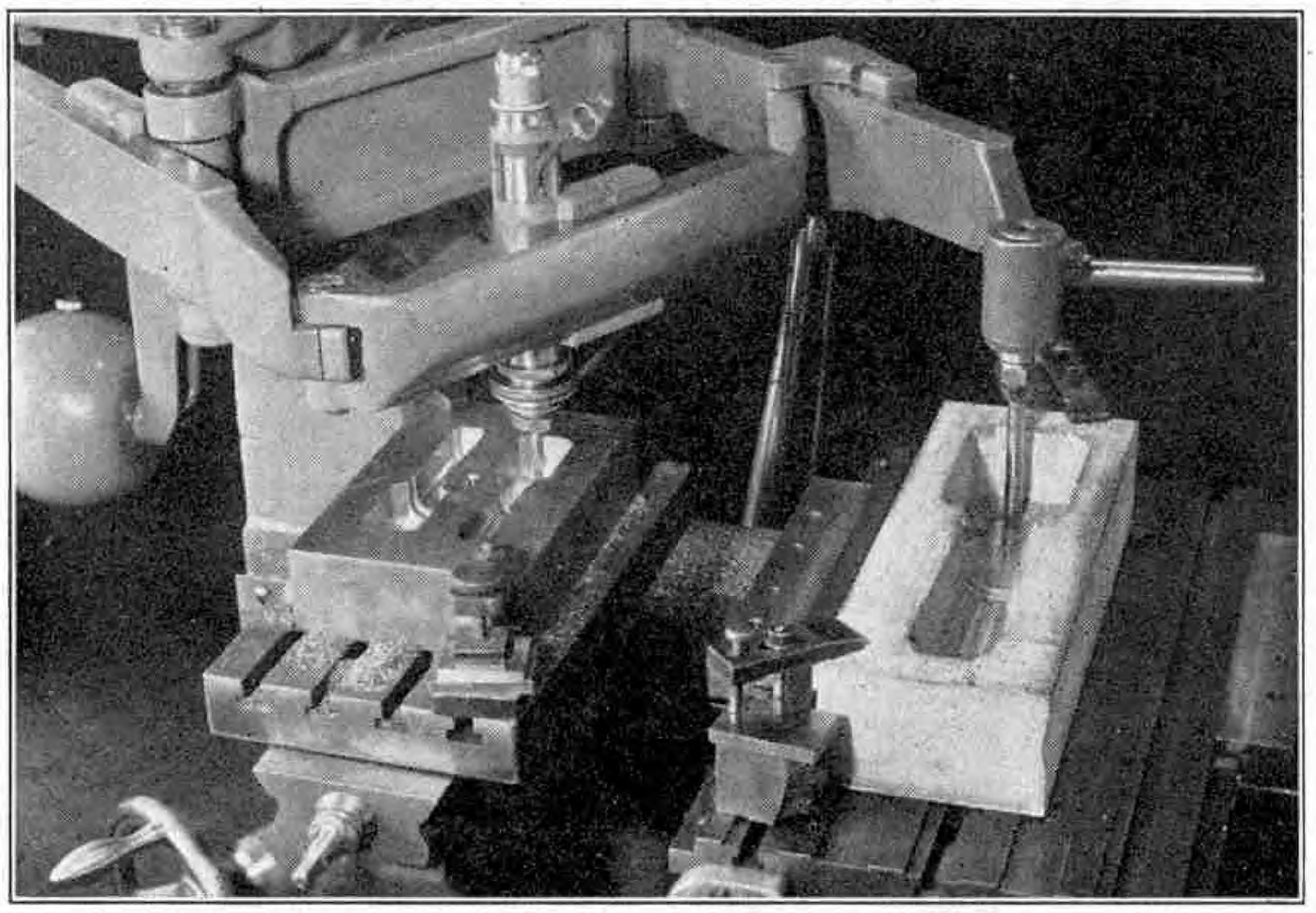
On New Year's Eve there are more parties, and this time these are not so strictly family affairs, friends and relations joining in as well. Just before 12 o'clock a bucket of water, some tin and an iron ladle are brought in before the fire. Father puts a lump of tin into the ladle and melts it over the flames. Then calling out the name of the oldest person present he pours the molten tin into the cold water. It sets into all kinds of curious shapes, and the owner is supposed to be able to foretell from it what the coming year holds in store for him.

Precision Tools in the Meccano Factory

A Remarkable Milling Machine

EVERY year many hundreds of people from all over the world come to Liverpool to make a tour of the great factory where Meccano and Hornby products are manufactured. Before these visitors leave the factory they are asked what has made the greatest impression on them; and almost invariably they express amazement at the precision machine tools. It comes as a revelation to them to find in a toy factory machines working to limits as fine as one two-thousandth of an inch (·0005 in.).

One of the most interesting of these precision machines is illustrated on the cover of this issue. It is known as a Universal Pantograph and Milling Machine, and it is one of the most ingenious machine tools yet produced. It is designed for producing rapidly in steel or other suitable materials all kinds of parts having irregular and intricate surfaces, such as die-casting moulds and embossing dies. When the photograph from which our cover was prepared was taken the machine was at work on the production of a die-casting mould for the Dinky Toys Empire Flying Boat.



A remarkable Deckel pantograph milling machine of the type described in this article. Photograph by courtesy of George H. Alexander Machinery Ltd., Birmingham.

Each mould or die is produced from a master copy made by pouring special plastic material over a hand-made wood pattern, and allowing it to set and harden. Some kinds of parts, however, can be copied direct from models made in hardwood. The machine consists of two horizontal tables, the positions of which can be adjusted as desired by means of handwheels. On one of the tables is mounted the master copy and on the other is placed a blank piece of steel or other suitable material in which the mould is to be cut. Each table is provided with T-slots and clamps to hold the copy and work in position. The copy holder can be adjusted vertically by means of a handwheel, and for carrying out certain kinds of work can be rotated about its axis. The work table also is movable vertically and crosswise and lengthwise to the machine base, and the handwheels by which the adjustments are controlled are engraved with .001 in. divisions so that adjustments can be effected to a very high degree of accuracy.

The essential part of the reproducing mechanism is the pantograph arrangement shown in the accompanying illustration. This is very similar to the pantograph used by draughtsmen for copying, enlarging, or reducing drawings. It is mounted above the two tables and consists of four steel bars or arms pivotally connected to each other in parallelogram formation. The entire pantograph structure is mounted in ball bearings in such a manner that it is free to move up and down and swing in any direction. The parallelogram is anchored at one corner, and at the opposite corner it carries a tracer point known as a style, which is used to trace over the surfaces of the master copy. The rotary cutter is mounted at any desired point on one of the sides of the parallelogram, so that it moves in exact accordance with the movements of the style. The position in which the cutter is fixed determines the ratio in size between the work and the master copy. This ratio can be varied between limits of 1 : 1.5 and 1 : 10. In order to simplify the operation of preparing the machine for work, the settings of the bars and tool holder for the most frequently used ratios are engraved on the pantograph bars.

When the machine is in action the operator grips the handle on the pantograph and guides the style carefully over the outlines and contours of the master copy. To make it easier to carry out this operation with the necessary delicacy the weight of the pantograph is counterbalanced by a heavy ball that can be moved along a balancing bar attached to the pantograph. Every movement of the style is transmitted by the pantograph to the cutting tool, which gradually cuts an exact reproduction on a reduced scale of the master copy.

The cutting tool is driven by an electric motor, mounted on a platform at the rear of the machine, the drive being transmitted to a pulley on the cutter spindle by means of an endless cord belt. The belt passes around idler pulleys carried on a spring-tensioned rod, and thus is kept always at the correct tension irrespective of the position of the cutter holder on the pantograph bar.

Various extra attachments are provided for use with the machine to facilitate the carrying out of special kinds of work. One of these is an automatic regulator for controlling the depth of cut when the machine is used for engraving. In this case the pantograph is locked so that it can be moved only in a horizontal plane, the necessary depth of cut being obtained by feeding the cutter downward. The cutting speeds vary from 1,500 to 9,500 r.p.m.

A Listener Visits St. George's Hall

Watching a B.B.C. Variety Programme

By Alec. A. Purves

AT last the invitation arrived—a blue ticket for the balcony of St. George's Hall, to watch a programme being broadcast. Excitedly we turned up the *"Radio Times"* to see what was scheduled for the appointed time, found it was to be a variety programme, and in due course arrived at St. George's Hall.

Our first impression was that we were in a small provincial theatre during its annual "spring cleaning," with a rehearsal about to commence. On the stage, which extends beyond where the orchestra and stalls would normally be, were sundry groups of people rushing hither and thither, moving furniture, pointing, gesticulating, tuning instruments, carrying scripts, polishing pianos and so on. Across the floor were a number of wires and microphone leads. Microphones were everywhere.

A fireman walked across the stage to confer with an official; several men in evening dress appeared, one being immediately recognised by the audience as Arthur Askey, the comedian. He appeared to be rehearsing his gags with a fellow artiste.

Looking around the hall, we noticed a number of "cupboards" with vertical shutters, built on the wings of the balcony, and wondered what they were for; we were to learn in due course.



The balancer's cubicle at St. George's Hall, showing the balancer and the gramophone operator at work. In the background is the producer overlooking the stage from a position where he can supervise the production. Photographs by courtesy of the B.B.C.

A burst of applause from the remainder of the audience brought our attention back to the stage, as a very attractive girl in evening dress walked in. She was followed by another, and the two sat down at the side of the stage. Then came a bevy of six, all dressed alike, who were obviously "singing sisters." The men's chorus entered, laughing and joking, and still the flustered activities of the three or four officials continued.

And now the red light flickered to give warning that there were only five minutes to go before the start. The orchestra was tuned up and individual members were playing short trilly "twiddley bits." John Watt, wearing a light brown lounge suit, supervised the preparations—everybody in place, opening chorus round one microphone, compere and comedian round another. He then told us to applaud and laugh at the appropriate times, whether we were amused or not, and—"Quiet, everybody!" A breathless hush followed for half a minute, until the red light flickered again and finally remained red. We were on the air!



The stage of St. George's Hall, with artistes at the microphone and the B.B.C. Theatre Orchestra in the foreground. High up on the right is the window of the balancer's cubicle.

John Watt, script in hand, made the opening announcement, starting with those familiar words, "This is the National Programme. . . ." Then the orchestra crashed in with the signature tune, and immediately we noticed the difference between broadcasting and concert technique. Here the orchestra, situated some distance from the microphone, can "drown" the vocalists, but as the latter croon quietly close up to the "mike" the result is perfectly balanced for the listener. The audience in St. George's Hall can hardly hear a sound from the vocalists, except when the music dies down to permit a purely vocal item.

Thus the trio singing the opening chorus appeared to be whispering. As soon as they had finished, they hurried away to the side of the stage although the orchestra was still playing, quite unlike concert behaviour.

Then the comedian started bullying the compere. This usually sounds spontaneous, but it is actually read, although the facial expressions and hand movements are all there. This cross-talk concluded with a very weak pun, at which a member of the effects department, standing beside the speakers and following the script, crashed a wicker basket, filled with broken glass or bits of metal, on the floor.

A short sketch followed in which the effects department again participated. The sound of a door opening and shutting was faithfully reproduced by means of a door latch fitted to the lid of a chest, while the unwrapping of a brown paper parcel was simulated by the assistant rustling his script.

After the sketch came a quintet of Austrian girls, singing German folk-songs, accompanied by a sixth at the piano. As each reached her solo part she stepped nearer the microphone, and when one solo was immediately followed by another, we saw a hasty interchange of heads round the "mike," especially when three or four girls each sang a few words in one verse.

This turn was followed by more quips and business by "Big-Hearted Arthur," ending with the effects man dropping a large packing case on the stage to "blot him out."

When Reginald Foort started to play the organ, we realised the significance of the shuttered cupboards on the balcony. He began with a quiet trill and we noticed a wavy shudder running right along the shutters; then the organ boomed forth and the shutters opened wide, one or two at a time. So now we knew that they must be the volume controls of the organ pipes.

In the last part of the programme we heard several new voices, including a very good whistling item by a siffleuse accompanied by Reginald Foort. Believing apparently in the maxim, "You can't keep a good man down," Arthur Askey popped up again with a comic song, which prompted John Watt to execute an unrehearsed tap-dance, but well away from the "mike." During the latter part of the song, however, his lightheartedness gave way to anxiety regarding the time, and he was to be seen exchanging frantic signals with the inhabitants of the Control Box,

(Continued on page 738)

How the Locomotive Works

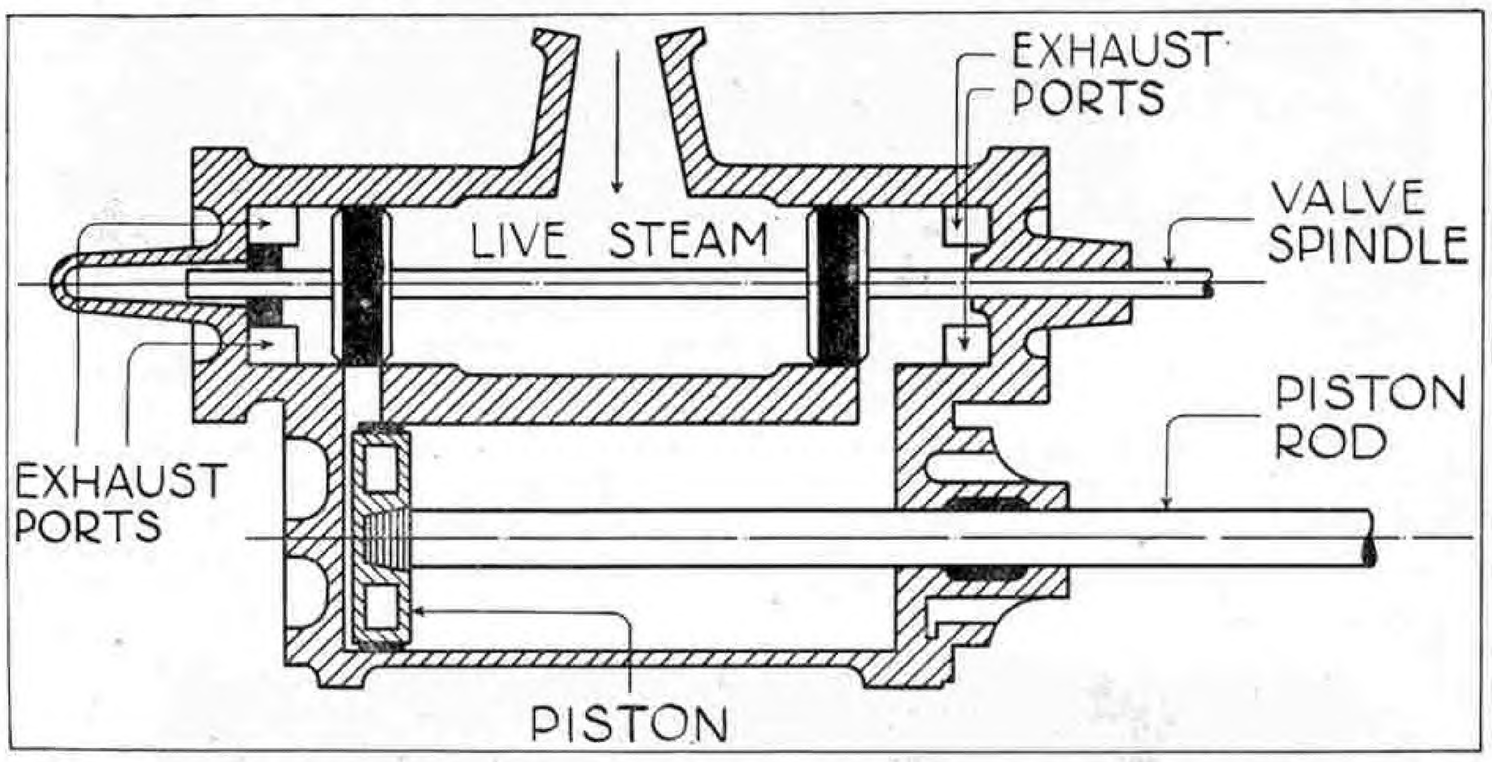
2. Cylinders, Valves, and Valve Gear

By a Railway Engineer

IN last month's "*M.M.*" I described the general layout of the boiler and fire-box of a steam locomotive, the method of raising steam, and the working of the injectors by which the boiler is kept full of water. I now come to the equally vital part of the locomotive where the energy of the high-pressure steam is changed into mechanical work.

The rate at which the boiler and fire-box can raise steam depends of course upon the rate at which coal is fired. For any particular fire-box however there comes a point beyond which the coal cannot be burned economically—there is not enough air—and this rate limits the output of the locomotive. A consumption of about 40 lb. of coal per minute is an average figure to-day with fast express trains, and for purposes of explanation I will assume that this rate is kept up throughout the run; steam-raising is thus uniformly rapid all the time.

When a locomotive is started up steam can be kept on for practically the whole of the piston stroke; on account of the slow speed steam is not taken from the boiler at a very high rate, and such working can be continued until a speed of about 10 or 15 m.p.h. is attained. But as the engine accelerates and the rate of using steam rapidly increases, the steam supply to the cylinders must be lessened otherwise the boiler would not be able to supply the demand. This lessening of the supply is done by causing the admission valve to close earlier in the piston stroke. The moment that the admission valve closes is called the point of "cut-off." In most modern locomotives the cut-off when working in full gear takes place after the piston has travelled 75 per cent. of its stroke, though on the majority of Sir Nigel Gresley's engines the full-gear cut-off is 65 per cent.



Section of a locomotive cylinder and valve chest showing the path of the steam in and out of the cylinder. The piston is about to commence its backward stroke, the rear port being already open to exhaust.

Now by the time a locomotive has attained 15 m.p.h. the cut-off will have been reduced to about 60 per cent., and then assuming that the train is accelerating along a level road, it is a case of reducing cut-off in direct proportion to the speed. At 30 m.p.h. the pistons will be moving twice as fast as at 15 m.p.h., and in order to keep the amount of steam taken from the boiler at a constant figure only half the amount used at 15 m.p.h. should be allowed to enter the cylinders; in other words the cut-off should be 30 per cent. By a proportionate reduction as the engine accelerates to full express speed the cut-off would be reduced to 15 per cent. by the time 60 m.p.h. is attained.

In actual practice the cut-off is reduced by steps rather than continuously, and in such a case as I have described the driver would probably adjust his gear from 60 to 50 per cent. at one movement, then 50 to 40, and more gradually thereafter. But the whole process of "notching-up," as it is called, is governed by the necessity of keeping the rate of steam consumption more or less constant. This essentially practical consideration is in itself quite sufficient reason for working at short cut-offs when running at high speed, but there is in addition the equally important matter of thermal efficiency entering into it. Indeed one cannot study the working of the steam locomotive without marvelling at the way in which the functioning of its various processes dovetail together into one remarkably complete and harmonious power plant on wheels.

When an engine is running with cut-off taking place at 15 per cent. of the piston stroke, a small amount of steam occupying just over one-sixth of the total volume of the cylinder is imprisoned. The natural tendency of high-pressure steam is to expand and the only way it can expand is by pushing the piston. In so doing the steam loses pressure until at the end of the stroke, when the exhaust valve opens, it is at very little more than atmospheric pressure. In order to use as little live steam from the boiler at each stroke the locomotive engineer aims at getting as much work as possible done entirely by the expansion of the steam. To do this, and so work at the earliest possible cut-off, high boiler pressure is necessary; otherwise the steam would be expanded and cooled to such a degree that condensation would take place in the cylinder.

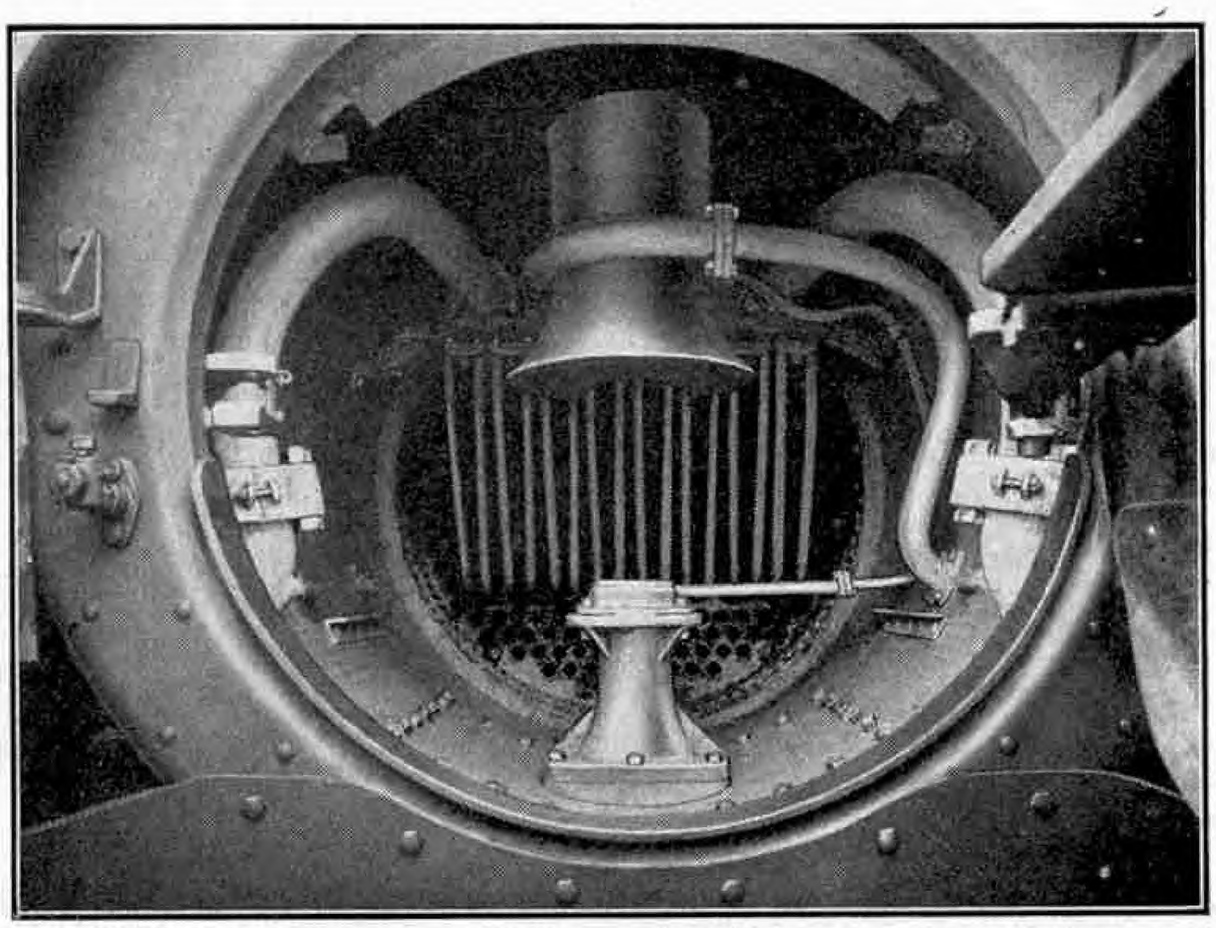
I have explained why it is necessary gradually to lessen the amount of steam passing into the cylinders as a locomotive works up to speed. There is another method which, as a practical measure, is just as effective as adjusting the point of cut-off, that is by partly closing the regulator. By so doing, however, not only is the amount of steam passing from the boiler to the cylinders lessened, but its pressure also is reduced. The actual regulator valve is like a sliding door that works at right-angles across a passage-way; when the door is partly closed a considerable restriction is caused and the steam that passes on does so at reduced pressure. When it reaches the cylinder this medium-pressure steam is not nearly so effective, and the admission valve has to be kept open longer so as to make the point of cut-off later and so gain more power.

The mere fact that when working with the regulator only partly open steam has to be admitted for a longer period of the stroke would seem to indicate a more extravagant use of the steam; actually however the explanation is not quite so simple. Such steam as passes through the restricted opening of the regulator valve not only loses pressure but in so doing increases its volume; for example, if the regulator is closed to such a degree that steam is entering the cylinders at 140 lb. per sq. in. against a boiler pressure of 220 lb. per sq. in. every cubic foot of steam taken from the boiler would become 1½ cubic feet after passing through the regulator. But a driver who worked in this way would need at least double the "cut-off," say 30 per cent., of that of his friend who worked with a wide-open regulator, and he would use about 20 per cent. more live steam from the boiler.

Readers who have followed the series of articles describing footplate trips will no doubt recall several occasions when famous types of locomotive were handled on the long cut-off method, with the regulator only partly opened; in view of my last remarks about the relative efficiency of this way of driving they may probably wonder whether the enginemen on such occasions were doing as well as they might. The modern locomotive is extraordinarily sensitive to slight variations in its mechanism; these usually affect the steaming in some way or other, and of course it is useless to go on working the engine in the theoretically correct manner if she will not steam. I once rode on one of a very famous class of British locomotives; normally 15 to 20 per cent. cut-off, with full regulator gave excellent results, but this particular engine would not steam at all if she was linked up below 33 per cent. Drivers quickly find out what adjustments of the various controls give the best results, and very often quite unorthodox methods give magnificent performance on the road.

So far I have referred only to single-expansion locomotives, in which all the cylinders take live steam from the boiler, and all

exhaust to the atmosphere. With the exception of the famous Midland compounds of the L.M.S. there are very few double-expansion locomotives in this country, but on the continent of Europe they are probably in the majority. Live steam from the boiler is admitted to the high-pressure cylinders; there it is only partially expanded, before exhausting into the intermediate steam chest, or receiver as it is called. From the receiver it is admitted to the low-pressure cylinders, expansion is completed, and it is then exhausted to the atmosphere. On a locomotive having a boiler pressure of 200 lb. per sq. in., the pressure of steam entering the low-pressure cylinders will be somewhere about 65 lb. per sq. in.



Inside the smoke-box of L.M.S. No. 6220 "Coronation." Steam passes to the cylinders through the large pipes at the side of the smoke-box and is exhausted through the blast pipe shown below the chimney extension. Photograph by courtesy of the L.M.S.

It is now time to say something of the ingenious mechanism by which the point of cut-off is adjusted, the reversing gear. For modern locomotives, at any rate in this country, the Walschaerts valve gear is more used than any other, and as it is usually fitted outside the movements of its various members are easier to study than those of gears such as Joy's, or the Stephenson's link motion, which are usually found between the frames. At the best of times the Walschaerts valve gear looks an extremely complicated mechanism, and even when a locomotive is moving slowly the functions of the individual rods are not easy to see.

The to-and-fro motion of a locomotive valve is a combination of two distinct movements, and once these two are separated from each other the valve gear mechanism becomes quite simple to understand. The first of those motions is a constant quantity backwards and forwards, no matter in what position the reversing screw may be; it is also exactly "in phase" with the motion of the piston rod, that is it changes from forward to backward motion at the same instant. Now when a locomotive is running in mid-gear, that is with the reversing lever half way between the full forward and full reverse positions, this "in phase" movement is the only movement that the valve possesses. Referring now to the diagram on this page, the rod N is motionless when the engine is in "mid gear," for although the curved link K is oscillating about its central pivot the sliding block is also in a position that coincides with that pivot. I will however explain more fully the actuation of the link K later on.

To the end of the piston rod A, moving in and out of the cylinder E, is connected the crosshead B; this latter has rigidly fixed to it a downward extension piece Q. From the extremity of Q is pivoted a system of two links, P and Q, both of which are free to move at all the joints. It will be noted that link O is also connected to the valve spindle G, at a point below its connection to the rod N. Now the upper extremity of link O is connected by a pin joint to the rod N, which latter is at rest; the reciprocating motion of the piston and crosshead imparts a large oscillating motion to the lower extremity of link O, but since the upper end is fixed, by the immobility of rod N, only a very small motion is given to the valve spindle G. It will naturally be asked, why it is necessary to move the valve spindle at all when the engine is in mid-gear: it is here that the mechanical construction of the valves and cylinder ports have to be taken into account.

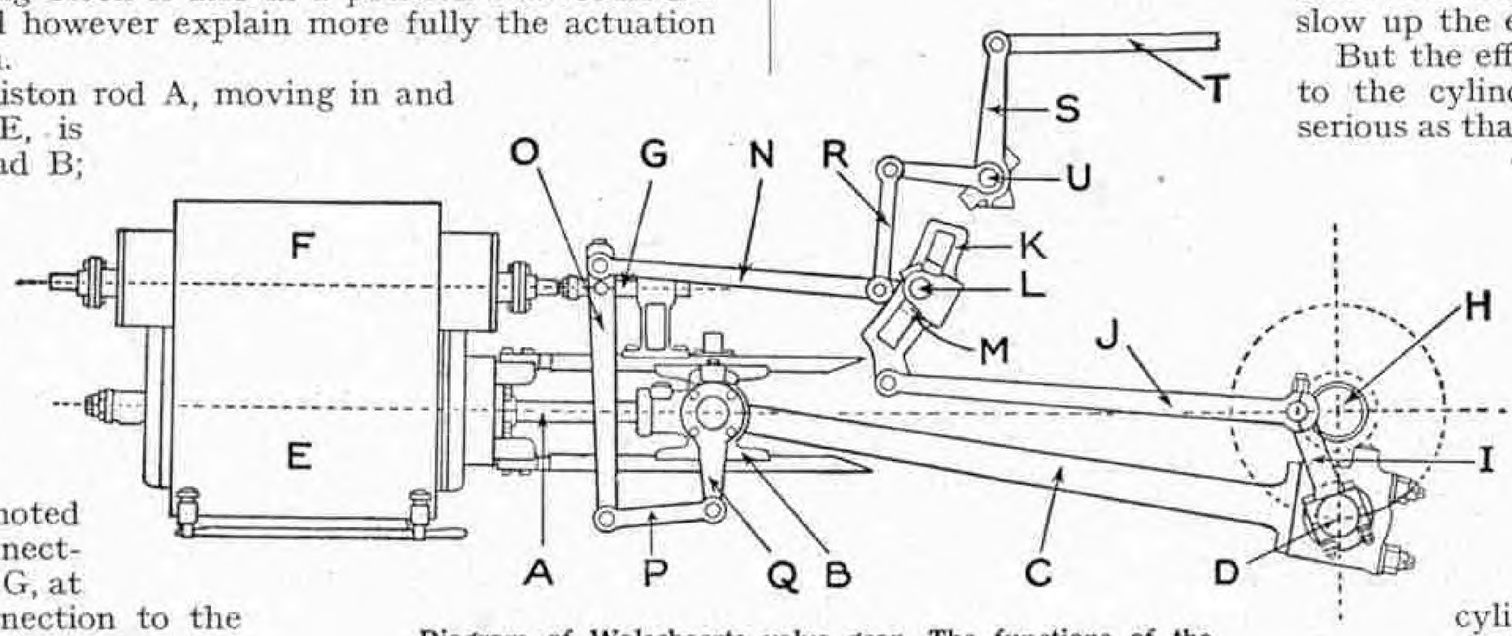


Diagram of Walschaerts valve gear. The functions of the various parts indicated by letters are described in this article.

On the previous page is a longitudinal section showing the arrangement of a piston valve and the cylinder that it supplies with steam. The piston is shown at one end of its stroke and the valve at the same end of the cylinder as the piston is just covering the steam port. The piston is about to move from left to right, but it is clear that if the valve were moved ever so slightly in the reverse direction steam would be admitted to the cylinder. But the engine is still in mid-gear, and therefore the valve travels in the same direction as the piston. The extent of its travel can be seen by referring to the port at the opposite end of the cylinder, for the valve at that end must move just far enough to the right to bring its steam face directly in line with the right hand steam port. In the position shown, of course, the portion of the cylinder to the right of the piston is open to exhaust. The portion of the valve motion derived from the crosshead is therefore revealed as that necessary to give the exhaust opening at each stroke, and to bring the valves just to the point where any further motion would admit steam.

The other component is now easy to follow. If the block L is moved either way from the mid-position of the link K, the fore-and-aft oscillating motion is given to the rod N and this motion becomes super-imposed upon the mid-gear movement of the valve spindle. The block L is by the way shifted by means of the reversing gear in the cab. Turning the reversing wheel, or moving the lever, pushes or pulls the rod T; this acting through the bell-crank S, which is pivoted at U, raises or lowers the die-block by means of the link R. The farther from the mid-position of the link that the die-block is raised the greater will be the motion imparted to the rod N, and consequently the longer will the valve be open to admit steam into the cylinder.

Space does not allow me to describe in detail the other valve gear most commonly used in this country, Stephenson's link motion, but though it differs considerably in detail and in action the net result is very much the same; in both gears the valve travel is shortened as the engine is linked up. Until comparatively recent times the mechanism fitted to most locomotives was such that as the valve travel was shortened, due to linking up, so also were the port openings lessened both for admission of steam, and for exhaust. Thus, when running fast on a fairly short cut-off, quite an amount of throttling took place due to the restricted entry to the cylinder. Such throttling naturally tends to slow up the engine.

But the effect of a restricted entry to the cylinders is nothing like so serious as that of a restricted exhaust. When the steam has been expanded and is at very little more than atmospheric pressure it flows much less readily than when entering the cylinder, when the pressure may be 200 lb. per sq. in. or more. At high speeds the exhaust steam has literally to be pushed out of the cylinders, and unless the exhaust ports are large, and the passages leading to the blast pipe carefully designed and free from sharp bends quite a lot of the engine's power may be frittered away. In some tests made not so many years ago on a famous British locomotive it was found that when running at 70 m.p.h. just one-third of the total power developed by the engine was spent in getting the steam in and out of the cylinder, that is half as much power as it took to haul 10 heavy bogie coaches along! By making the total travel of the valves longer the exhaust opening can be improved and in most locomotives of to-day the full exhaust port opening is obtained even though the engine is running fully linked up, at 15 per cent. cut-off, or less.

Such are the essential factors in the functioning of the steam locomotive. There are other appliances, such as feed-water heaters, and mechanical lubricators which help to improve performance, but they rank as accessories rather than vital components.

Puzzle Your Sharp-Eyed Friends

More Conjuring for Christmas Parties

By Norman Hunter (From Maskelyne's Mysteries)

IN this article I am going to describe a few tricks that are simple to carry out, but will be found very effective. Those of my readers who wish to perform them will have no difficulty in making or contriving the few pieces of apparatus necessary, and with a little practice will be able to mystify their audiences completely.

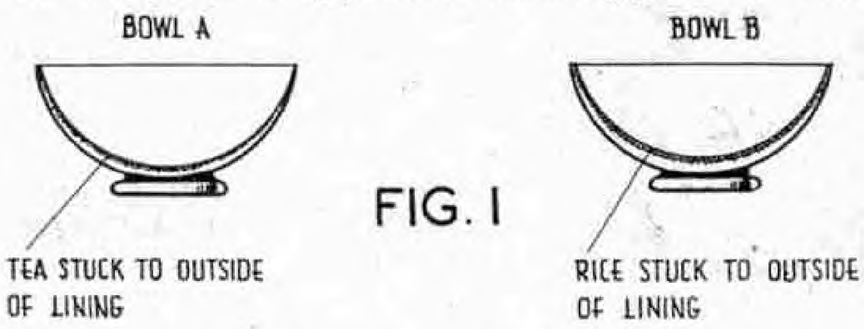


FIG. 1

CHANGING TEA INTO RICE

To start off with here is one of those effective tricks in which two things change places. In this case the things are a bowl of rice and a bowl of tea. Two bowls are shown to be empty. One is then filled with rice and one with tea. A plate is laid over each bowl and they are turned upside down. A black handkerchief is laid over the bowl of tea and a white one over the bowl of rice.

"By changing the places of the handkerchiefs," you say, "I make the contents of the bowls change places too. Watch." You pick up the handkerchiefs and change them over so that the white one is on the bowl of tea and the black on the bowl of rice. You then lift the bowls. Out of the bowl in which you put the tea pours the rice; the bowl you filled with rice now contains the tea. Both bowls may be handed for examination.

The Secret. You will need four tin or aluminium bowls; get shallow ones if you can. Cut two of them down with metal cutting shears until they will fit snugly into the other two bowls. All four bowls should of course be of the same size. Now stick rice all over the outside of one of the cut down bowls and stick tea all over the outside of the other cut down bowl.

To prepare for the trick, put some tea into one of the bowls and press the tea covered cut-down bowl into it. Do the same with rice in the other bowl. Fig. 1 shows a sectional view of the bowls. The bowls may now be shown quite freely and will appear empty, the fact that the insides are rather shallower than the outsides will not be noticed. Be careful to mark the bowls so that you know which contains tea and which the rice.

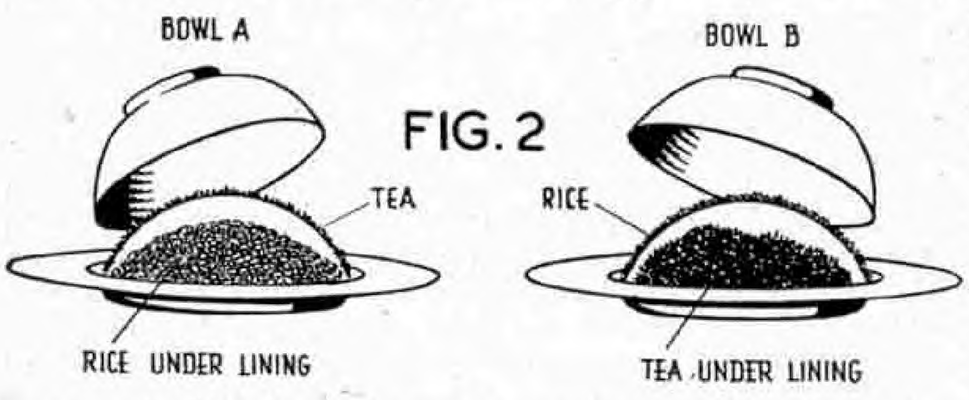


FIG. 2

Into the bowl containing tea pour some rice until it is level full. In the same way fill the bowl secretly prepared with rice, using tea for the purpose. Place a plate over each bowl and invert them. The by-play with the handkerchiefs is only for effect. In lifting the bowls you leave the linings behind. These cover the heaps of rice and tea and make them look like the opposite commodity. The loose rice and tea which was between the bowl and lining pours out and effectively disguises the presence of the linings. (Fig. 2.)

To make the trick easy to work, the linings should be trimmed so that they are an easy but not too loose fit. They can be held in place by the fingers during the first part of the trick, and will remain on the plates of their own accord at the finish. At the end of the trick the bowls can of course be examined.

A LANTERN MYSTERY

Next comes a showy little item very suitable for finishing a performance. Having produced a lot of coloured silk handkerchiefs and flags, you drop them on to a tray; then, picking all the silks up in a bunch, you change them instantly into a large, lighted Japanese lantern.

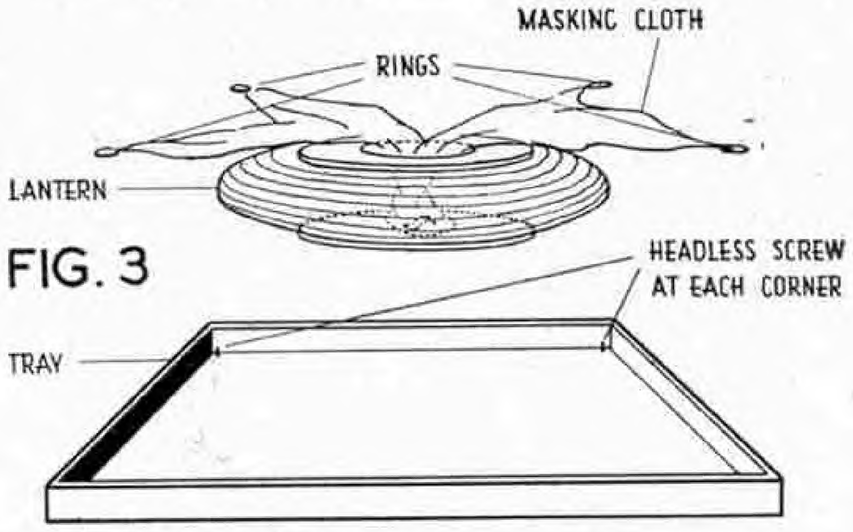


FIG. 3

The Secret. The whole secret is in the tray. This is square and just large enough to take the lantern when folded. Cover the top of the tray with a piece of patterned material such as cretonne. Now cut another square of the same material and sew a tiny metal ring to each corner. Drive a small screw into each corner of the tray and cut off the heads of the screws. The finished square of material should be of such a size that when the four rings are slipped over the four screws the cloth is stretched tightly over the tray.

Now for the lantern. Get one made of fabric if you can; it will last longer than a paper one. Take off the deep rim at the top and fasten in place a flat ring cut from a piece of thin plywood. Take off the bottom of the lantern and put in its place a flat disc of plywood. Close the lantern, and to the centre of the bottom disc, on the inside, fasten the centre of the square of fabric you have prepared. On top of this fasten a simple spring clip. To help the lantern to open quickly you can also screw a flat piece of lead to the bottom.

Figs. 3 and 4 explain very clearly the way in which the lantern is concealed. To set the trick, first fold the lantern and pull out the square of cloth all round. Place the folded lantern on the tray and slip the rings over the screws. The tray will then appear empty, and the lantern will be hidden under the cloth as in Fig. 4. The clip alone will be visible.

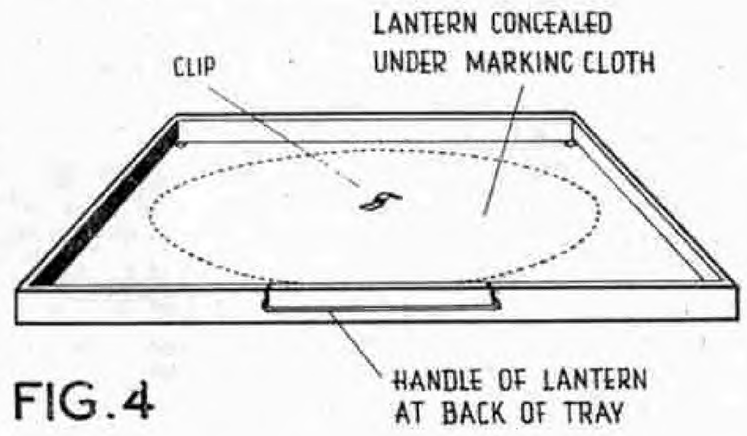


FIG. 4

In performing the trick lay the silks on the tray, and as you put the last one down tuck them all into the clip. Now pick up the lantern by the handle, which projects through slits cut in one side of the tray as shown in Fig. 4. The weighted base of the lantern will cause it to open, swallowing the square of masking material and all the silks.

The lighting of the lantern is simple. Get an electric torch and solder the case to the top of the handle of the lantern. Remove the lens and bulb. Attach a length of flex to a bulb holder containing a bulb and connect this to the torch case. Put the bulb on the end of the flex into the folded lantern before fastening the masking cloth down. When you pick up the lantern all you have to do is to switch on the torch in the ordinary way, and the lamp in the lantern will light.

STAMPS THAT FLY

Now for a trick with a novel touch about it. A trick with postage stamps.

"Everybody knows you have to stick stamps on a letter if you want it to go by post," you say, "but not everyone knows it is the flying ability of the stamps that actually transports the letter." When the laughter has died down after this "calm whopper" you pick up a large knife and show both sides of the blade. You then stick three stamps, or rather three squares of coloured paper to represent stamps, on each side of the blade. There is a red one in

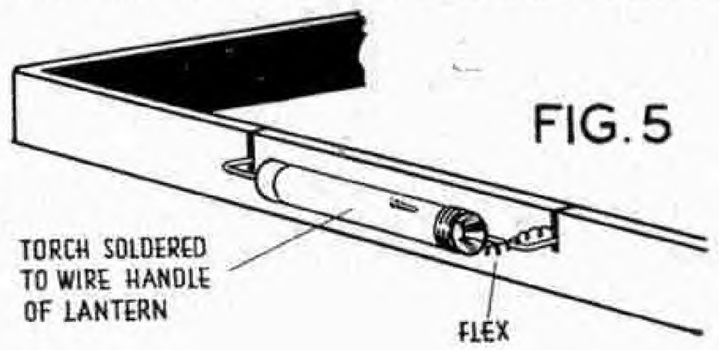


FIG. 5



FIG. 6

the middle, a blue one on one side and a green one on the other side. You show both sides of the knife with the six stamps on the blade. "Postman" you shout. Instantly the papers vanish and both sides of the knife are shown blank. Once again you cry "Postman!" and back come the stamps again.

The Secret. You can get just the right kind of knife for this trick at the sixpenny stores; a pastry knife, which has a flat blade and a nice round handle. The whole secret of the trick consists in giving the knife a peculiar twist while showing both sides of it.

Have a saucer of water handy. Pick up the knife and show both sides of it. Take a paper square, dip it in the water and stick it in the centre of the blade. Show both sides of the blade. Now take another red square and apparently stick it on the plain side of the blade. Actually just as your hand reaches the knife you roll the handle round in your fingers and stick the second red square above the first. Now to show that there is a red square on each side of the blade, exhibit the side with the paper on, then with a swinging-over movement of your arm apparently show the other side of the blade. In making the swing-over movement with your arm, roll the handle of the knife in your fingers again. You will then find that you are still showing the same side of the blade, although to the audience it appears as if you have shown both sides. Practise this move, because it is the key to the whole trick. Fig. 6 will show you how to make the twirl with the knife.

Now using the same method stick the green and blue squares on the knife, sticking both green ones on the same side, then both blue ones, one above the other. You can then show that there are apparently six stamps

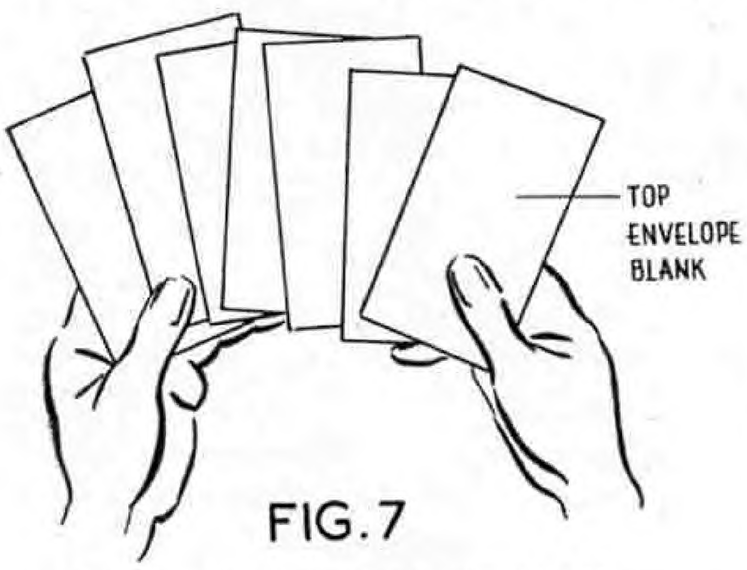


FIG. 7

HOLDING THE ENVELOPES SO THAT THE STAMPS ARE HIDDEN

on the knife, three each side. The trick is now as good as done. On the shout "Postman!" you quickly flick the knife over; then, using the twirl again, show both sides of the knife apparently plain. To make the stamps come back, reverse the movements.

A TRICK WITH ENVELOPES

Here is another trick with stamps that will work very well in conjunction with the one I have described above. Neatly performed it is a profound mystery.

You have six envelopes and a pencil. Going to six members of the audience, you ask each one to write his or her name on

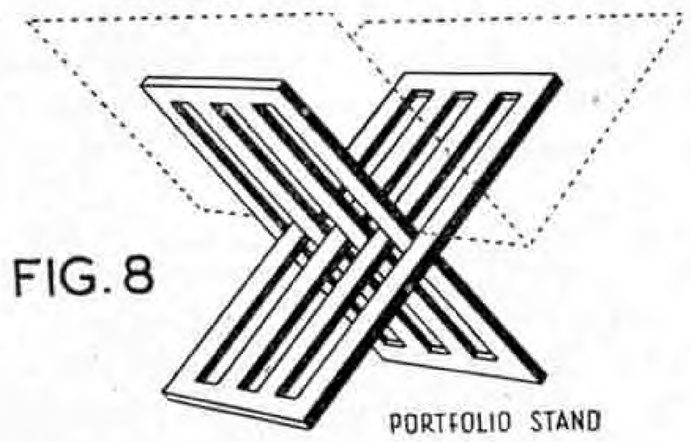


FIG. 8

one envelope. You put the envelopes on a glass tumbler in full view while you vanish the six stamps as already described.

"This is useful when you forget to stamp your letters" you say, "You can send the stamps on to catch up the letters."

Going to the envelopes you pick them up one at a time. Each now has a stamp in the top right-hand corner, and each also bears the genuine signature of the person who marked it.

The Secret. You have seven envelopes instead of six. Six of them have stamps, or rather coloured paper labels, stuck on them. The seventh is plain. The plain envelope is on top of the pile. Show the pile of envelopes, then fan them out as shown in Fig. 7. Thanks to the top one being plain they will all appear plain. Do not deliberately say that the envelopes are not stamped and the audience will accept them as plain. Now go round and have the envelopes signed, but keep your hand over the top one so that this does not receive a name. As you return to your table slip this envelope below the others. Doing the business with the knife and stamps next will cause the audience to forget the envelopes, and when later on they are shown them bearing stamps they will remember only having signed them and will have assumed them to be plain.

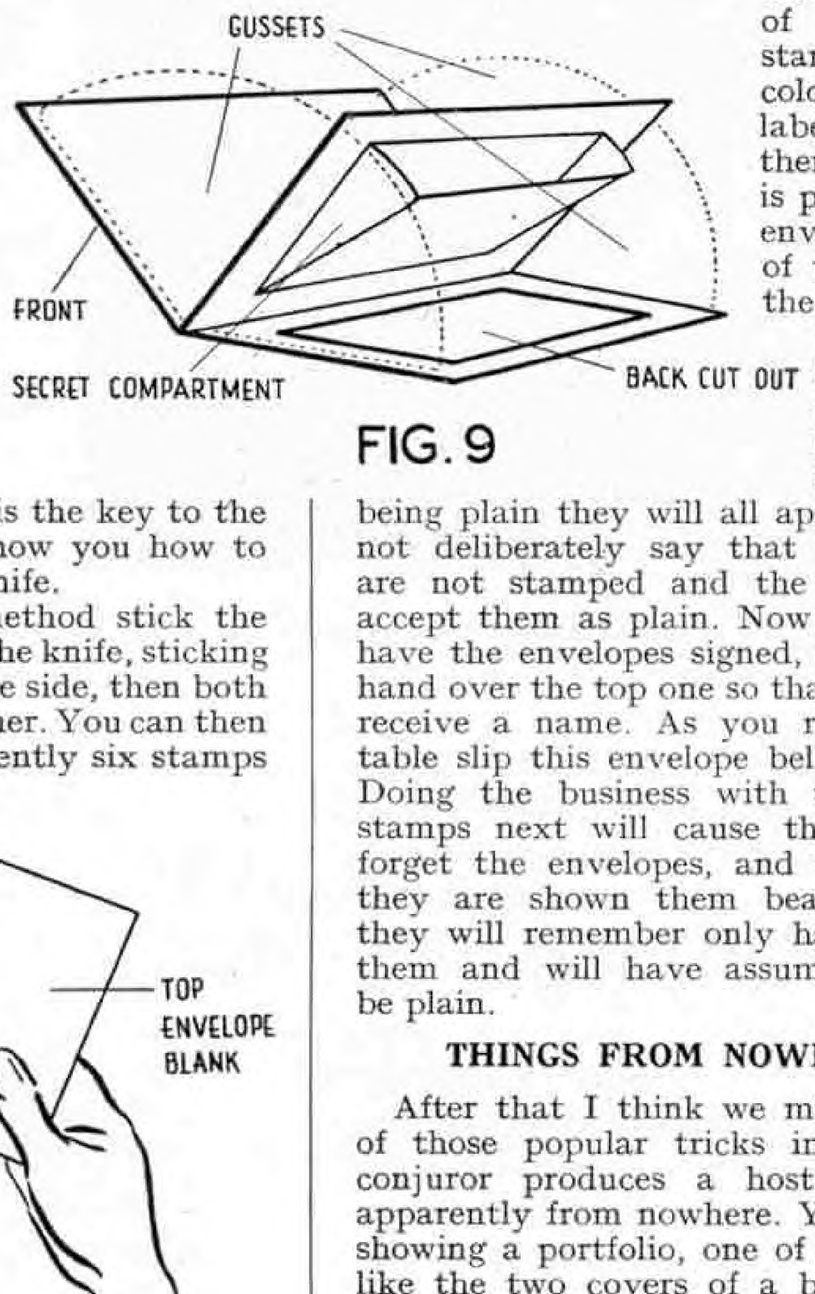


FIG. 9

THINGS FROM NOWHERE

After that I think we might try one of those popular tricks in which the conjuror produces a host of articles apparently from nowhere. You begin by showing a portfolio, one of those affairs like the two covers of a book, usually employed for holding sketches and papers of different kinds. You open it and show that it is empty. You then put it on a small stand on your table, a mere skeleton affair, and instantly take out of it flags, handkerchiefs, ribbons and so on.

The Secret. The stand has no trick about it, being used simply to hold the portfolio. It is a sort of miniature easel as shown in Fig. 8. The portfolio itself is easy to make but awkward to describe. If you look at Figs. 9 and 10 you will get a good idea of its construction. Briefly speaking it is composed of three boards instead of two. The front is plain and solid. The back is a mere framework, the centre having been cut out. Between these two boards is another of the same size having attached to its back a wedge shaped compartment.

The articles to be produced are packed into this compartment, and the portfolio, opened out, is placed on the stand. The ends of the portfolio are provided with gussets of thick paper or book binders cloth so that it is not possible for the audience to see into the portfolio through the ends. There are two gussets at each end, one between the front of the portfolio and the movable centre board, the other between the centre board and the back. It will now be clear that whether the portfolio is opened at part A (Fig. 11) to show it empty, or at part B to allow the articles to be produced, there is always a gusset at each end for masking purposes. These gussets should be made the shape of half a circle so that the portfolio may be opened out sufficiently to show it

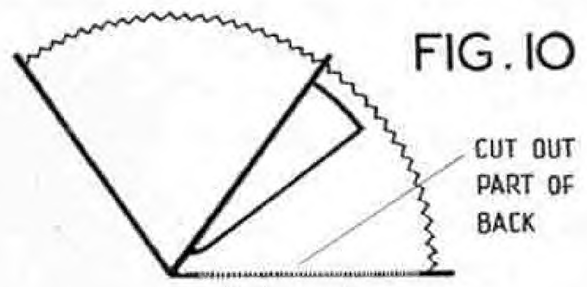


FIG. 10

empty without making it necessary for you to tilt it and expose the secret compartment.

When you show the trick, take the portfolio off the stand and open the front part. It will appear quite empty and flat, the secret compartment being at the back. You then close it and put it back on the stand, opening it again at the back part. All you then have to do is to take out the articles already packed into the secret compartment.

It only remains to suggest how to present these tricks effectively, and this will offer no difficulty to the amateur conjuror if he practises them. The essence of conjuring is rapid movement at exactly the right moment, and it would obviously be courting disaster to try out these or any other tricks without rehearsal.

Another great help is a flow of easy talk, the purpose of which is to distract the attention of members of the audience. I have suggested suitable patter for some of the tricks described, and this can easily be extended by the inclusion of jokes or

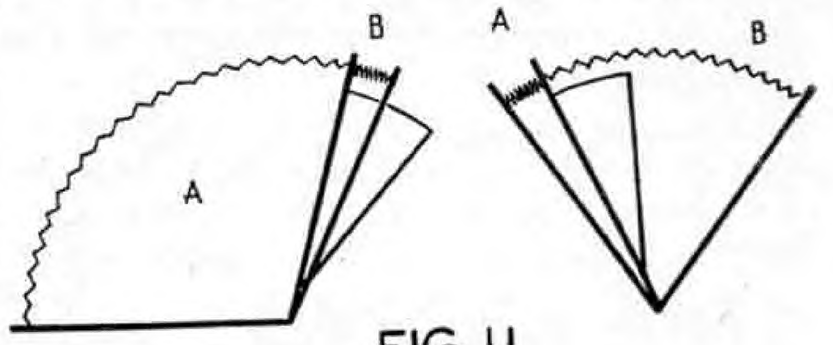


FIG. 11

humorous stories, or perhaps of comments on certain members of the audience. The entertainer may even arrange for a confederate in the audience, who might be instructed to start an argument at a critical moment to attract attention while the conjuror makes some rapid movement in connection with his trick.

Finally let me warn those who give a conjuring entertainment against repeating their tricks before the same audience.

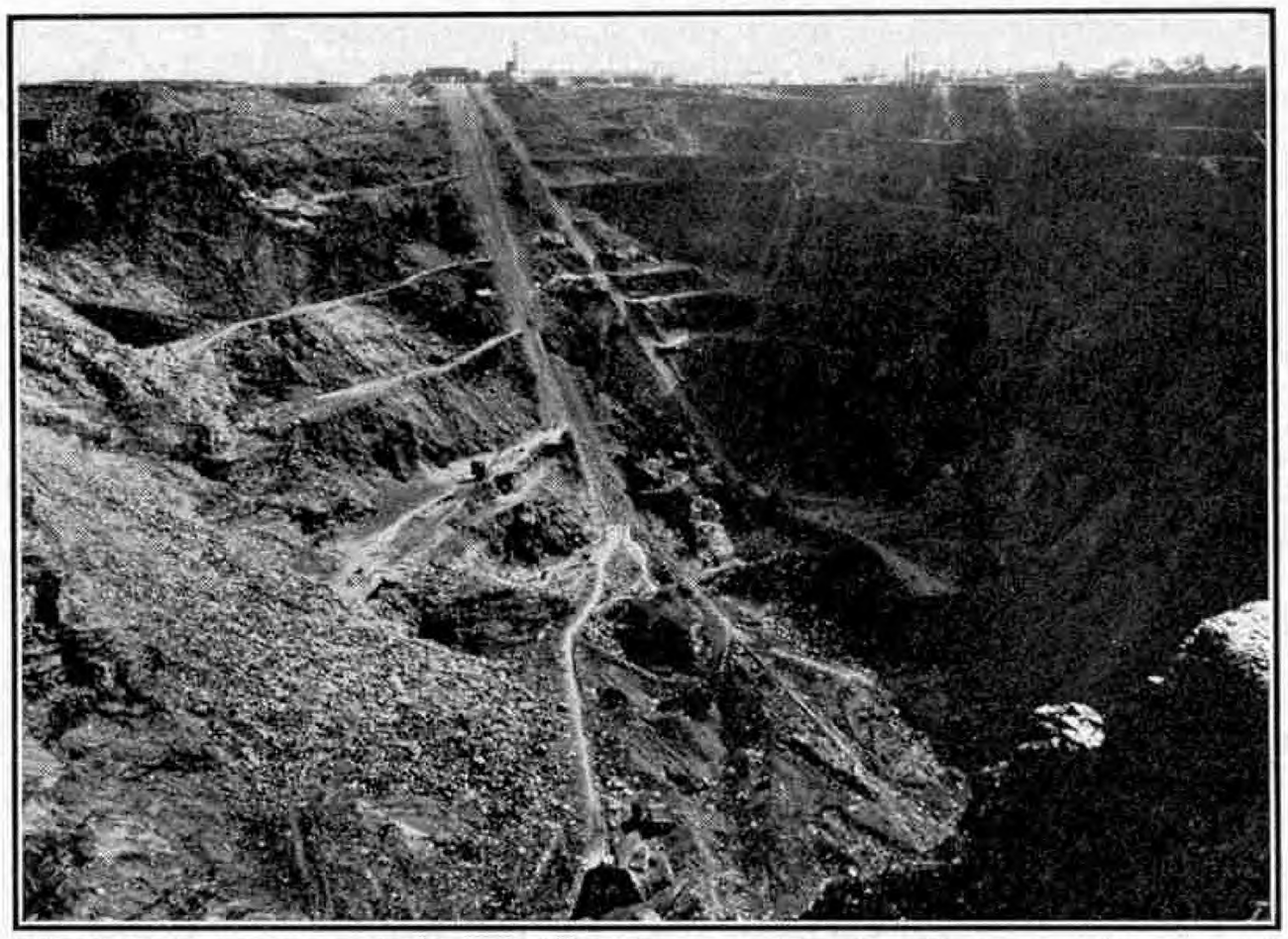
England's Largest Slate Quarry

Circular Saw With 300 Diamond Teeth

By Garry Hogg

A FEW miles inland from Tintagel, in the heart of the King Arthur country, lies Delabole, the largest sla e quarry in England. Seen from an aeroplane, it appears to be a giant crater, a little longer than it is broad and covering some 40 acres. But the most impressive view of it is from the quarry bed. Standing on the uneven piles of broken slate the visitor can look upward to the irregular edge of thin turf more than 400 ft. above his head.

Hundreds of thousands of years ago this slate was a fine mud formed partly of weathered rock and partly of volcanic dust and ash. This was distributed by vast forgotten rivers over the sea bed, and then lifted above sea level by the action of the forces that created our mountains and hills. From these very processes slate has gained its unique advantage—the "fish-scale" formation that makes cleavage possible. The actual rock is a fine network of microscopic crystals of mica, with pyrites, quartz and other minerals. Some of the iron-bearing minerals have been dissolved and, by seeping into the cleavage planes, have produced the reds and russets and greens that make Delabole slate so rich in artistic effects.



The Delabole slate quarry, in Cornwall. This photograph shows the galleries on which the rock is blasted, and the inclines up which it is hauled. The illustrations to this article are reproduced by courtesy of "Mine and Quarry Engineering."

Four hundred years ago at Delabole there were simply a number of small quarries, each worked independently by its owner, but there is now one vast crater that produces annually some 250,000 tons of rock and still appears inexhaustible. Incidentally, it is interesting to note that a proportion as high as 90 to 95 per cent. of this huge total has to be written off as "waste," so that a tremendous amount of energy and skill goes to the production of a relatively small bulk of top-grade slate.

The four hundred men employed here are divided, as far as the quarry itself is concerned, into two gangs—the "rock men" and the "fillers." The first of these are the highly skilled veterans who drill and blast the rock on the "galleries," which may be seen clearly in the first illustration. The second gang are responsible for loading the rock on to the trucks and despatching them to the various sheds for treatment by saw and chisel and plane.

There are set hours for blasting. Between these hours men are at work with compressed-air drills, cutting deep slots into the solid rock and charging them with gunpowder or other explosives. At the "Stand clear" signal—a long blast from the big Ruston-Bucyrus whistle—the men make for shelter, and soon afterwards muffled roars can be heard from half a dozen points in the quarry at once. Clouds of smoke and dust rise from the different galleries, and avalanches of rock fall for several minutes afterwards.

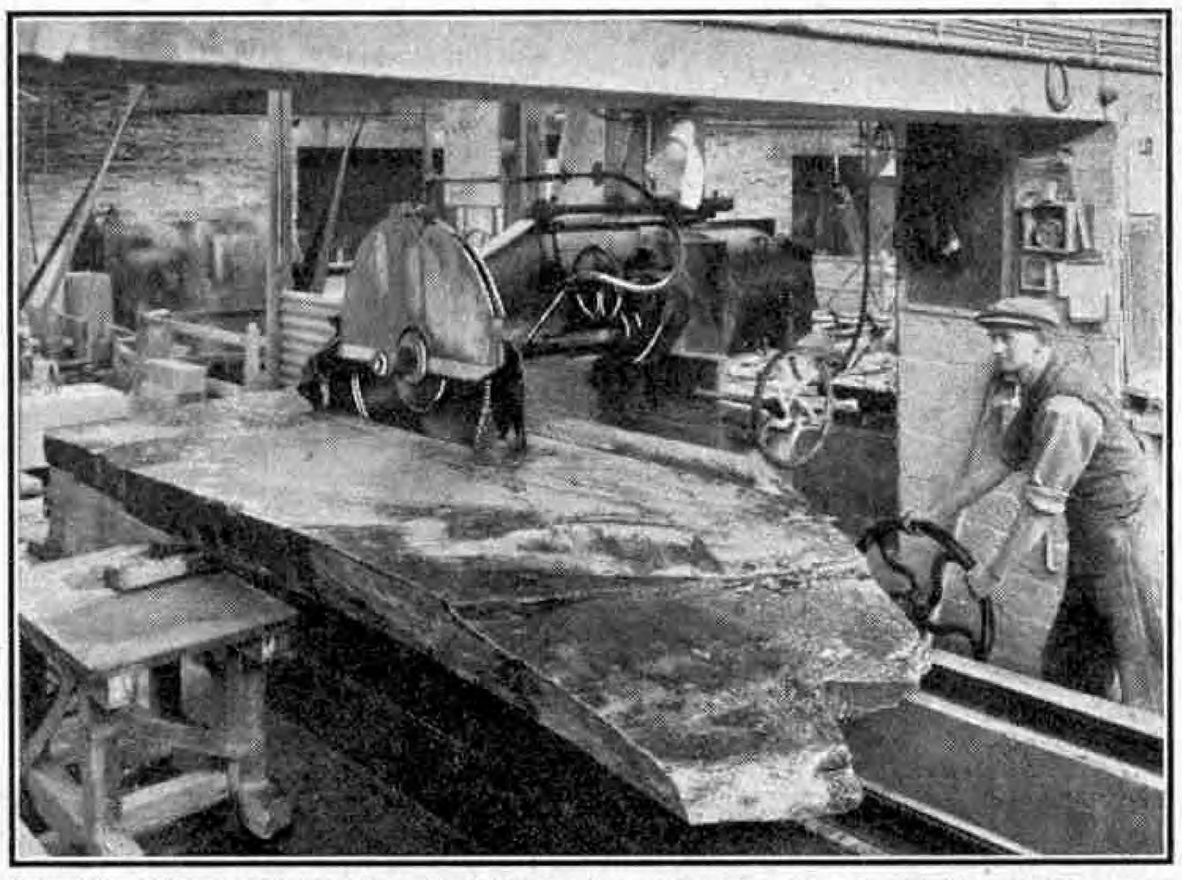
At the "All clear" signal the men return to view the results of the blasting, and then follows the most dangerous part of their work. Blocks of slate 10 or 12 tons in weight may be poised on steep slopes, dislodged by the charge but not sent to the quarry bed. It is then the job of the quarry foreman to decide which shall be handled, and how. If a block cannot be shifted with crowbars a stout wire hawser is made fast to it, and at a given signal a steam crane, perhaps 100 ft. below, is set in motion. As the hawser is wound in, slowly but surely the block tilts and slips. The craneman, his hand on the brake and his keen eye watching the towering mass, coaxes it gently but inexorably until it topples and slides to the bottom.

Owing to the immense depth of the quarry there has to be a limit to the size of block sent up to the dressing-sheds. Small stout wagons of about four tons capacity run on rails along the galleries, and any block of the right weight is hoisted aboard, man-handled along to the incline, and then hauled to the surface by a wire hawser wound on a large drum in the engine room. The gradient is as steep as one in two, yet so skilled are the winding engine drivers that it is many years since there was an accident.

When a block is too large to be hauled up intact it is taken in hand by veteran rock men, who have an uncanny knack of assessing the "cleavage-way" and the "grain" of the rock, which is not apparent to the eye of the mere visitor. The block may be 12 ft. long, 6 ft. wide at one end, and 2 ft. thick. Two or more holes are first bored, taking the line of the grain or cleavage-way. Compressed air tools are used, and the drills are round steel double chisels, $\frac{7}{8}$ in. and 1 in. in diameter. Into the first hole, when drilled deep enough, wedges are inserted one at a time, and tapped shrewdly with a sledge until they are flush with the surface. By this time the second hole will have "started" a little, and it can be "feathered." A larger wedge is driven in, until the first hole "starts," and an even larger wedge can be inserted in turn. Finally, unless there is some unsuspected flaw in the block, the great mass will be

split perfectly from end to end, opening into two sections as neatly as a book.

The "waste" goes up by one runway direct to the spoil heap; the good rock, suitably marked by the quarry foreman, takes another track to the dressing-sheds. In addition to the haulage system already described there is a Henderson Cableway with a span of nearly 800 ft. and a carrying capacity of four tons. It is used for conveying blocks of slate, or trucks of smaller material, from one side of the quarry to the other, and for haulage from very steep faces on which a truck-line could not be safely worked. The cables, 500 ft. overhead, seem as slender as packthread. At one point there may be seen the "snapjack," a wooden block adjusted in such a manner that when the overhead trolley reaches it other mechanism comes into operation and the load is moved vertically instead of horizontally. When the snapjack has to be altered a workman is sent out along the cable on the trolley!



Squaring slabs of slate 2 or 3 in. in thickness by means of a circular saw. One saw in use at Delabole has a blade with 150 sockets, each fitted with two diamonds.

At the head of the incline each truckload is weighed and checked before proceeding to its destination. Apart from the spoil heap there are two main dressing-sheds, one for green slate and the other for grey. The processes are the same, the distinction being made only because the Delabole Quarry specialises in artistic blending of colours in roofing slates, and are of very great interest.

The first process is splitting. Each block is first split into slabs 2 or 3 in. thick, after which the slabs are placed on a saw-bench and cut square to approximately the size required for the batch of finished slates, which may be anything from 12 in. by 6 in. to 30 in. by 15 in. There are various types of saw in use, one of the most interesting being the Anderson-Grice diamond saw, which has a blade 42 in. in diameter with 150 sockets, each fitted with two diamonds. The saw is capable of cutting through a block 12 in. thick and, running at 600 r.p.m., can cut up to 60 or 70 sq. in. of slate a minute.



Splitters at work. With mallet and chisel they separate slabs of slate into sheets that may be scarcely ¼ in. in thickness.

From the saw-benches the slabs pass to the splitters. Though various machines for splitting slate have been tried out none of them has been found as efficient as the "bettle and chisel" method, which is as old as the industry. The bettle is a short handled heavy iron-bound wooden mallet, and the chisel has a stout 3 in. blade. The slab rests beside the splitter's left thigh. With his chisel he marks a line round the cleavage-way almost as quickly as it could be drawn with a pencil. Then, one slick cut here and another a little further along, and a thin slate, perhaps hardly ¼ in. in thickness, falls away from the slab. Another and another and another, and the slab is done with. Occasionally there will be a small ridge or prominence, due to some flaw in the slate-formation, in which case the faulty slate is tossed over the splitter's shoulder into a waiting truck, for carriage to the spoil heap. The good slates pass to the dresser, who operates a revolving knife. Working against a gauge set to the dimensions he wants, he trims each slate dead square and true.

There are also several processes which belong to slates used for purposes other than roofing. If the slate is to be used, say, for shelving, or lintels, or window-sills, it must be given a smoother surface than that which results from the splitting. So it is taken to a planing machine in which a nine-inch blade passes to and fro across its surface.

If an even finer finish is required, as would be the case, for instance, for a lettered headstone, the slate is then polished. There are two methods of doing this. One is to coat the slate with a mixture of silica sand and water, and then "work" it with a heavy pad on a universal joint that is suspended overhead and manipulated by hand. The other, which produces the finest finish of all, is a "Flextol" polisher, fitted with carborundum discs of the highest grade. The surface obtained by this method is almost unbelievably fine, and makes the slate resemble polished marble in its smoothness.

The Delabole Quarry has been worked for over 400 years, but one department is very new. Experiments have been made in grinding waste slate, which is collected from the dressing-sheds and taken to an Edgar Allen jaw-breaker, and thence to an Edgar Allen pulveriser. After various processes of grinding, screening, drying and filtering an extremely fine powder is obtained, and this, known as "Delafila," is used in the manufacture of such things as paint, bitumen and ebonite.

Another use for "waste" that has been evolved comparatively recently is the manufacturing of building blocks. These blocks, which are a mixture of slate waste and rapid hardening cement, are made in machines and have been proved excellent for almost all building purposes.

No visit to the quarry would be complete without a call at the power house and the repair shops. In the latter there is tackle to deal with any emergency, and so efficient is this department that the Delabole Quarry is practically self-contained.



AIR NEWS

Britain Regains World Long-Distance Record

The world long-distance record for aeroplanes was regained for Great Britain on 5th–7th November last by two Vickers "Wellesley" monoplanes of the Long Range Development Unit, R.A.F. These aircraft flew non-stop from Ismailia, in Egypt, to Darwin, Australia, a distance of 7,162 miles, beating by 856 miles the previous record figure of 6,306 miles set up on 12th–14th July 1937 by the Russian airmen M. Gromov and A. Youmachev, when they flew non-stop from Moscow by way of the North Pole to San Jacinto, California, in 2 days 14 hrs. 17 min. The R.A.F. flight was much speedier than that of the Russians, taking only 2 days 5 min.

Five Vickers "Wellesley" aircraft left Upper Heyford on 24th October and flew by way of Malta to Ismailia, the starting point for the record flight. On 5th November three of these aeroplanes, each with a crew of three, took off from Ismailia on the non-stop flight to Darwin, Australia. They were led by Squadron Leader R. Kellett, and at first the aeroplanes kept together. Eventually, however, they began to spread out, and 12 hrs. after the flight began the leading aeroplane had covered 2,080 miles and was about 80 miles ahead of the second one, and the third had covered 1,950 miles.

The route followed was across India, the Bay of Bengal and the Dutch East Indies. The minimum distance to be flown to beat the previous record was 6,368 miles, and on the route followed this distance was reached at the southern end of the island of Celebes, in the Dutch East Indies. All the aircraft reached and passed this point, but a little later No. 2 aeroplane ran short of petrol and had to land at Koepang, on Timor Island, 400 miles from Darwin. The other two aircraft continued non-stop to Australia, appearing over Darwin flying side by side. The third one followed them and arrived there about 3½ hrs. later.

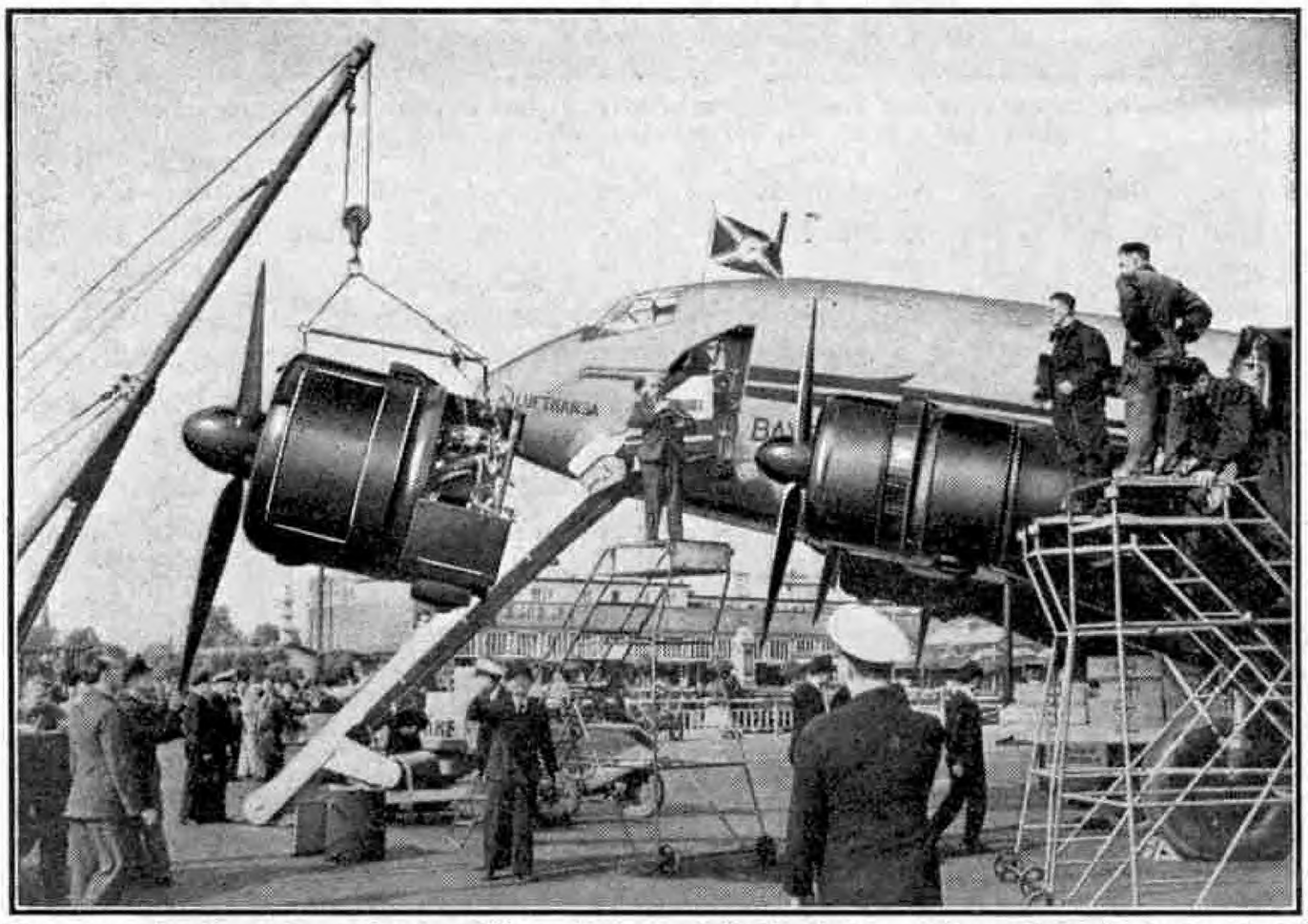
This remarkable flight of just over two days involved about 23 hrs. of night flying, and the territory covered included mountainous regions and vast deserts. The weather encountered ranged from thunderstorms to calm moonlight. A naval watch for the fliers was kept in the Arabian Sea, Bay of Bengal, and the Timor Sea, and the searchlights of vessels taking part in this were operated to give navigational aid to the fliers.

A full account of this wonderful flight will appear in an early issue of the *"M.M."*

Progress of Air Service Training School at Hamble

Training facilities at the Hamble school of Air Service Training Ltd. have been increased by the installation of direction-finding equipment. This school is claimed to be the largest of its kind anywhere, and during the past eight years it has gained a world-wide reputation for training commercial air pilots and ground engineers. The instruction given to prospective pilots includes, of course, navigation and meteorology, and in order that the equipment for this tuition shall be of the most modern and efficient type the company have installed six direction-finders in the school multi-engined aircraft, and have built a ground direction-finding station of the latest pattern. This station was designed by Marconi engineers. It operates in conjunction with the school's main wireless station, and is suitable for both day and night work. Constant two-way communication with School aircraft can be maintained up to a distance of at least 200 miles during the day, and much further at night.

Similar equipment is in use along the principal air routes of the world, and also at the North Atlantic air bases at Foynes and Botwood. The direction-finders in the School aircraft are the same as those in the Empire flying boats of Imperial Airways.



Three ground engineers demonstrating at Tempelhof airport, Berlin, that any of the engines of a Junkers Ju 90 air liner can be replaced in 25 minutes. Photograph by courtesy of Junkers Flugzeug- und -Motorenwerke A.-G.

Another Mayo Composite Aircraft to be Built

The four-engined seaplane *"Mercury,"* the upper component of the Mayo composite aircraft, arrived at Southampton on 20th October last, after her record flight to Capetown, reported in last month's *"Air News"* pages. An important feature of that flight was that the seaplane was launched in mid-air with a much heavier load on board than in previous tests. For the return flight *"Mercury"* had to take off as an ordinary seaplane. The trip was made by easy stages, and followed the regular Imperial Airways route.

The mid-air launchings of the seaplane from the back of the flying boat *"Maia"* have been so successful that a landplane version of the composite aircraft is to be built. The two components of this will be four-engined machines. The upper one will have a retractable undercarriage, and due partly to this will be capable of a top speed of about 300 m.p.h. It is calculated that at this speed, and carrying a ton of mails, the aeroplane could fly from London to New York overnight, thus enabling letters posted in London in the afternoon to be delivered in New York the next morning.

The new Mayo composite aircraft will be able to take off from any aerodrome that complies with Air Ministry requirements, and the principle of separation of the two components in the air will be the same as in the present composite aircraft.

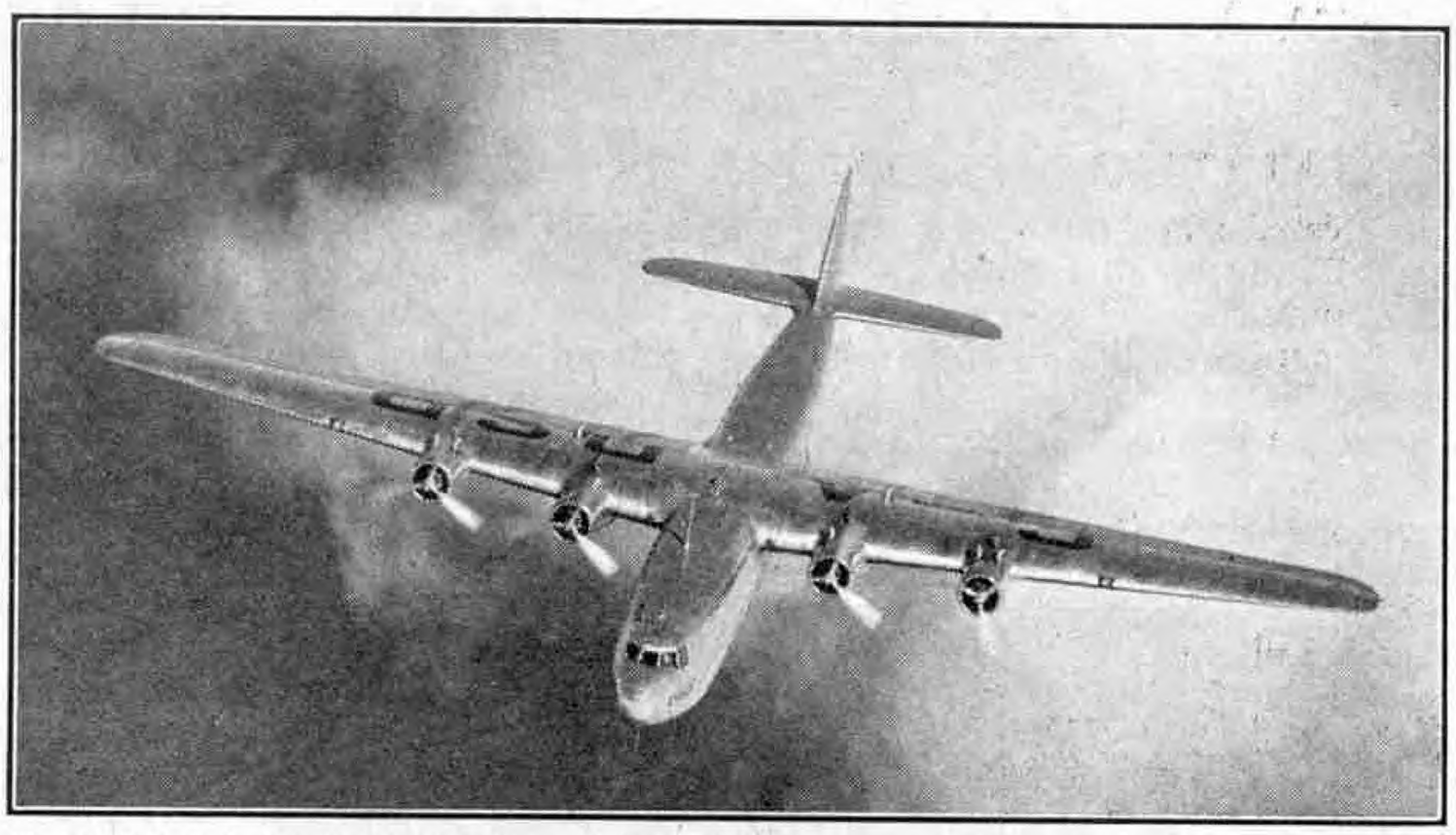
"Heracles" Completes Seven Years of Flying

The Imperial Airways air liner *"Heracles"* recently completed seven years of airway operation, during which it has flown nearly 1,250,000 miles and has carried 95,000 passengers. It made its maiden flight on 11th September 1931, and on the seventh anniversary of this event was operating its usual service between London and Paris. This liner is one of the fleet of "Hercules" and "Hannibal" class aircraft that were the first big 4-engined passenger aeroplanes to be put into regular service on commercial air routes. The "Hercules" type were equipped for service on the European routes and the "Hannibals" on the Empire routes. They were the successors of the famous "Argosy" three-engined air liners introduced by the company in 1926.

New Landplanes and Flying Boats for Imperial Airways

Imperial Airways are rapidly increasing their already large fleet of aircraft. Delivery has begun of the 14 "Ensign" or "E" class air liners being built by Sir W. G. Armstrong Whitworth Aircraft Ltd., and the first of these aeroplanes, which bears the name given to the new fleet as a class, is shown on this page.

The "E" class are intended for service on the company's European and Empire air routes. The European type will carry 40 passengers, and the Empire type 27 passengers by day and 20 by night, and up to 1¾ tons of mail and freight. "*Ensign*" itself is of the Empire type, but it has begun its career by going into preliminary service on the London-Paris air route. When experience in operating it has been gained, and others of the new fleet have been delivered, it will be transferred to an Empire route, and probably will participate in an overland service to India. Further details of the "Ensign" aircraft are given on page 709 of this issue.



"Ensign," the first of the 14 Imperial Airways air liners classed under that name, is now in service, and here is shown in the air. Photograph by courtesy of "The Aeroplane."

The company have also received the first of eight new 24-ton flying boats being built for them by Short Bros. (Rochester and Bedford) Ltd. These are identical in appearance with the Empire or "C" class flying boats, but are being made capable of carrying an additional 5½ tons of "all-up" weight. They will be called the "G" class of Imperial Airways' aircraft. The one just delivered is named "*Champion*," and others to be delivered shortly will be known as "*Cabot*," "*Caribou*," "*Connemara*" and "*Clyde*" respectively. The remaining three flying boats are earmarked for use on the trans-Tasman service linking Sydney, Australia, with Auckland, New Zealand, early next year. They are to bear the names "*Actearoa*," "*Australia*" and "*Awaroa*."

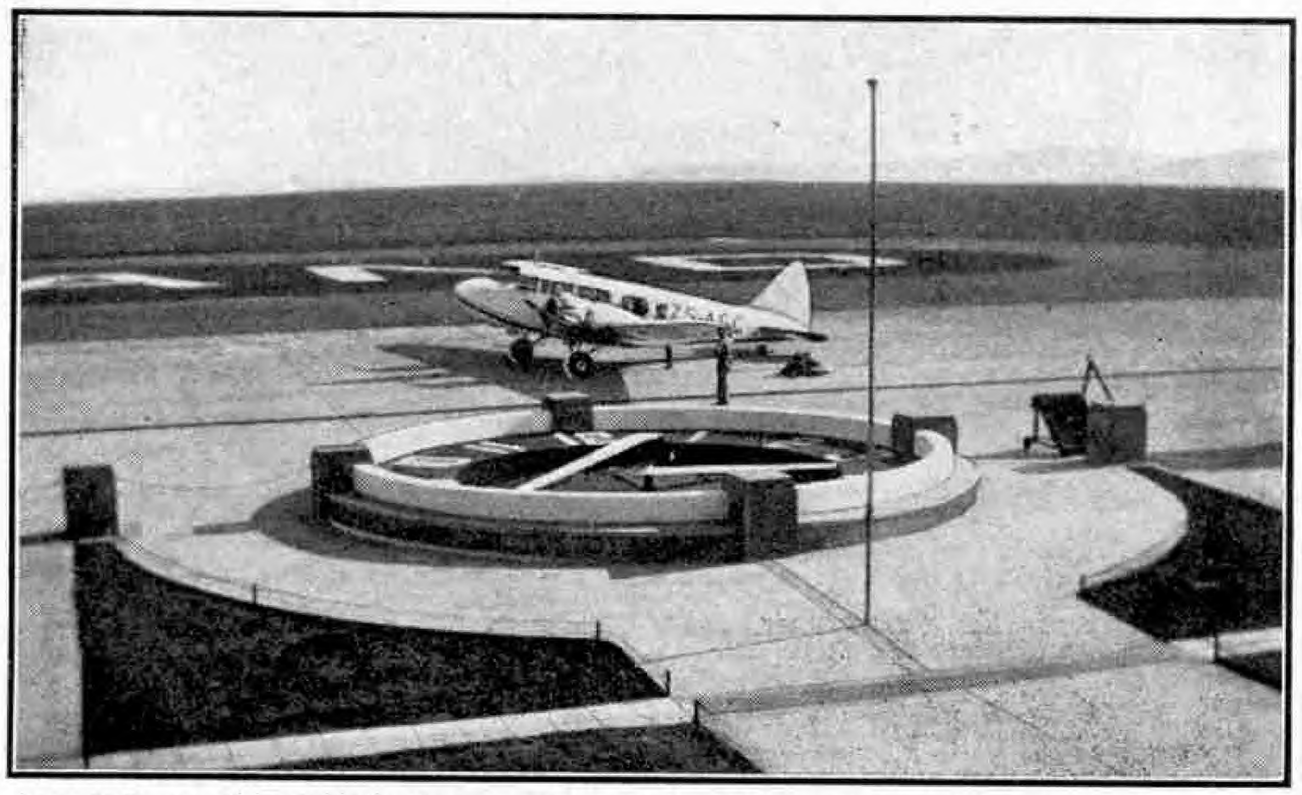
Every effort is being made to bring as many as possible of these new flying boats into service in time to help in coping with the expected enormous rush of non-surcharge Christmas mail on the Empire routes.

Research Department at Fairey Works

On 24th October last a new research department at the works of the Fairey Aviation Co. Ltd., Hayes, was opened by Sir Kingsley Wood, Secretary of State for Air, who then made a tour of inspection of the building. The chief feature of this is a wind tunnel 110 ft. long, in which models of new types of aircraft will be tested for lift and drag in an airstream of 145 m.p.h. This airstream is created by a 14-ft. four-bladed airscrew, and after being smoothed out by a system of baffles and vanes it passes through the testing section of the tunnel, in which the model under trial is suspended from measuring balances. This section is 22 ft. long, 12 ft. wide, and 10 ft. high. The aircraft models are made in a workshop on the premises.

Big Air Ministry Order for Lockheed Spare Parts

The British Air Ministry have placed an order with the Lockheed Aircraft Corporation, of California, for about £780,000 worth of spare parts for the 200 Lockheed 14 bomber-reconnaissance monoplanes ordered last June. This is the largest spare parts order ever received by the company. Production of the aircraft is now well in hand, and the first consignment should be on its way to England by the time these notes appear. It is reported from New York that the aeroplanes will be shipped in parts to Liverpool, and that 80 mechanics will be sent from California at the expense of the British Government to supervise the assembling of the aeroplanes in a Liverpool factory.



A reader's snapshot of the landing ground at the Rand Airport, Johannesburg, South Africa. In the foreground is the huge horizontal clock. The aeroplane is an Airspeed "Envoy." Photograph by D. Parsons, Malvern, Johannesburg.

World Altitude Record Gained by Italy

The world altitude record for aeroplanes was gained for Italy on 22nd October last by Lieut. Col. Mario Pezzi, Commander of the High Flying Section of the Royal Italian Air Force Experimental Establishment at Guidonia, when he flew to a height of 56,017 ft., or just over 10½ miles. The flight was made in calm weather and lasted 1¾ hrs. Lieut. Col. Pezzi used a Caproni biplane fitted with a special Piaggio engine and a hermetically-sealed cabin in which a pressure suit and breathing apparatus were not required. It is interesting to recall that on 7th May 1937, he flew to the then record height of 51,362 ft.

The new record exceeds by 2,080 ft. the previous one, which stood at 53,937 ft. and was achieved by the late Squadron Leader M. J. Adam, R.A.F., on 30th June 1937. This flight was made in the same Bristol 138a monoplane that was used by Squadron Leader F. R. D. Swain, R.A.F., when he set up the previous official world altitude record of 49,944 ft. on 28th September 1936.

Successful First Year of Isle of Man Air Services

Isle of Man Air Services Ltd. recently completed a very successful first year of operation, during which over 600,000 miles of flying were accomplished without any mishap to passengers or freight. The company's aircraft conveyed over 26,000 passengers and more than 500,000 lb. of mails and freight. About 20 passengers hold season tickets for regular journeys between the island and the mainland.

The company was formed last year by the merging of the interests in air transport to the Isle of Man of the L.M.S. Railway, the Isle of Man Steam Packet Company, and Blackpool and West Coast Air Services Ltd.

Lockheed "Electras" for Australian Air Route

Recent deliveries of Lockheed air liners include two 10-seater "Electras" shipped to MacRobertson-Miller Aviation Corporation Ltd., of Perth, Australia. They are to be used on the company's 2,200-mile air route linking Perth and Darwin. It is expected that they will be in operation by Christmas, and that they will reduce the flying time along the route by several hours. These aircraft cruise at 190 m.p.h., and with full load they have a range of nearly 900 miles. They are equipped to carry two pilots and almost 10 cwt. of freight in addition to the 10 passengers.

The Making of a Wheel

From Wood Pattern to Finished Casting

By Matt. D. Laws

I WAS immediately interested when my young friend told me that he would like to be an engineer.

"Oh! And why do you fancy that?" I asked.

"Well," he pondered, "I suppose I like to know what makes the wheels go round."

"Have you any idea how the wheels are made?" I asked.

He had not.

"Then," I said, "let us take an imaginary trip through an engineering works and see the process."

Look at this uncouth pile of scrap metal. Here lie the rudiments of our wheel. Curled turnings, grotesquely carved remnants, even a solitary horse-shoe peeps out at us; all this apparently useless stuff is really valuable material.

So we go to the pattern-shop. Here a wood model of the wheel is made from drawings already prepared by the draughtsman. This model, or pattern as it is called, has several peculiarities of construction that are worth noting.

In the first place, it is bigger in all dimensions than the casting will be. This is essential and we shall see the reason for this later. The pattern-maker works with a special rule, called a "contraction rule." Although this is marked in inches like a standard rule it is really a little longer. You will see, therefore, that by working with this rule the job is automatically made bigger.

Secondly, although there will be a hole in the centre of the casting there is not one in the pattern. Instead a circular boss, of the same diameter as the hole is to be, is fixed on each side of the pattern. Furthermore, where the casting has to be machined, the amount of machining is allowed. So you will see that this wood model is by no means a replica of the iron wheel.

Let's go into the foundry and see the mould being made from the pattern of our wheel. This foundry is a lofty building; very untidy looking, with heaps of loam here and there. And we must watch our shins as we walk, for all around lie metal boxes of various sizes. These are the mould boxes. Lugs protrude from the sides. Some of these are for interlocking purposes and others are to take the crane hooks.

Our pattern is placed in one of these boxes, and loam is packed around it with a pneumatic rammer until only the top surface can be seen. A second box, interlocking, is placed on top. This also is filled with loam and rammed. The pattern is hidden from view.

Now the upper box is removed. Then, carefully, the pattern is lifted from the loam. There in the mould is the shape of our wheel.

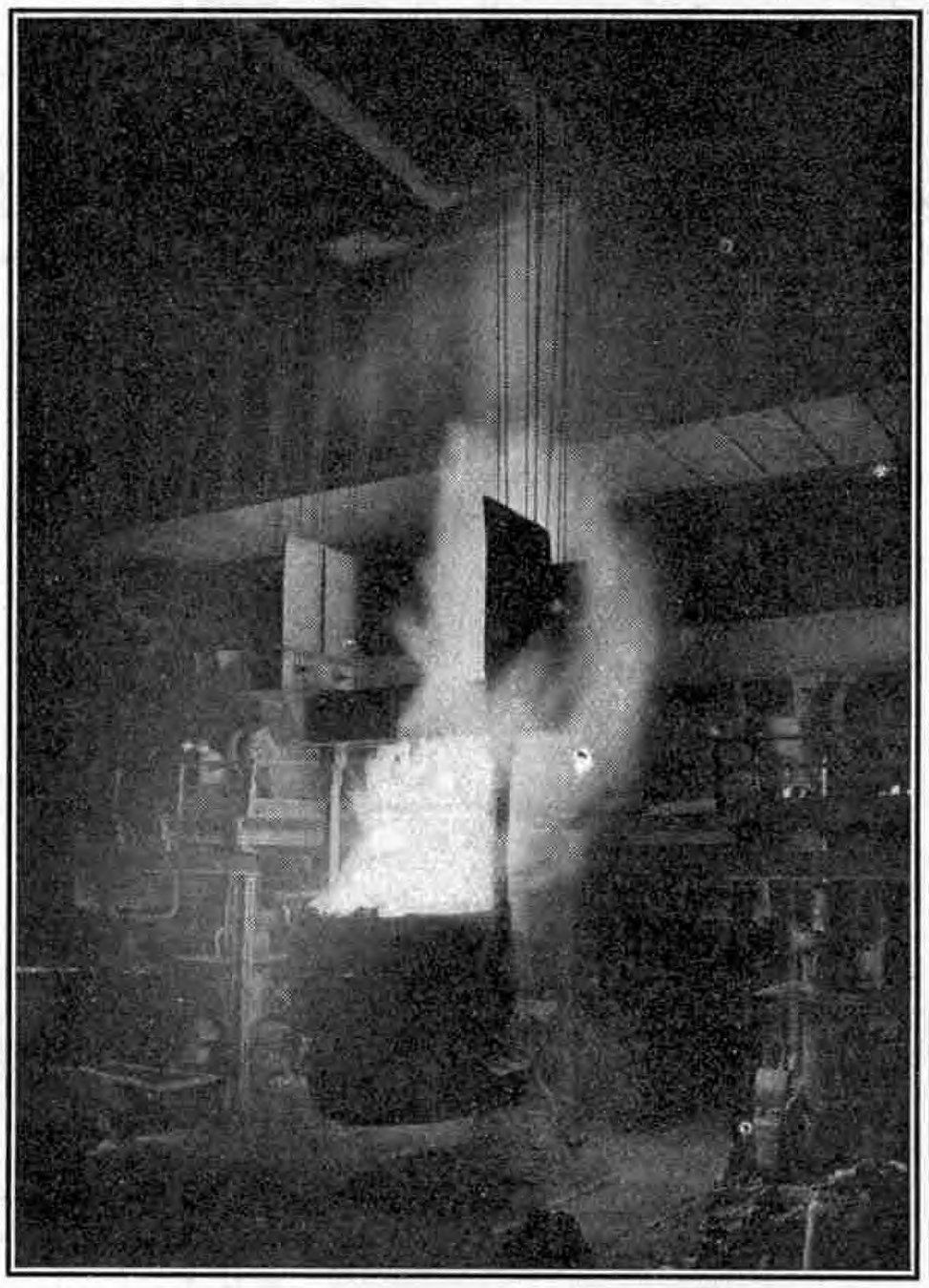
The moulder now smooths the surfaces and removes any irregularities. He also places the "core" in position. This core forms the hole in the wheel. It is a hardened cylinder of loam, and it fits into the cavity formed in the mould by the boss on the pattern.

Now the top box is replaced and the mould is almost ready to receive the molten metal. There is a hole known as the "gate" through the loam to allow the metal to flow into the mould. The mouth is scooped out to a cup shape. All joints are stopped with clay.

Now we shall go over and see the metal being poured into the ladle. The iron is melted in a huge funnel-shaped receptacle. This is the "cupola," and it is fed from a staging half way up its side.

The man at the base looks at the metal through a spyhole, like a chef peeping into his oven. All is ready. The draught is shut off and the tiny door is opened. As the metal flows down the short spout it spits and crackles. Soon the ladle is filled. It is hoisted by the overhead crane and carried to the mould.

Watch out for flying spots of metal as the ladle is canted. A workman skims off the impurities as the metal flows. Although, as we know, all joints have been sealed, puffs of smoke and thin trickles of metal appear here and there. The metal is still disappearing. Then, with a splutter, the gate fills up. Our wheel is cast.



The metal from which a wheel is cast is carried to the mould from the cupola in which it is melted in a ladle suspended from a crane.

Next day the mould is broken and the crane lifts the new-born casting from the debris. As it hangs in mid air the wheel is an untidy, ragged-looking object. Pieces of loam and thin "fins" of metal adhere to it.

The foreman taps the wheel sharply with a hammer. It rings true. Next it goes to the cleaner who knocks out the core and proceeds to make the casting more presentable.

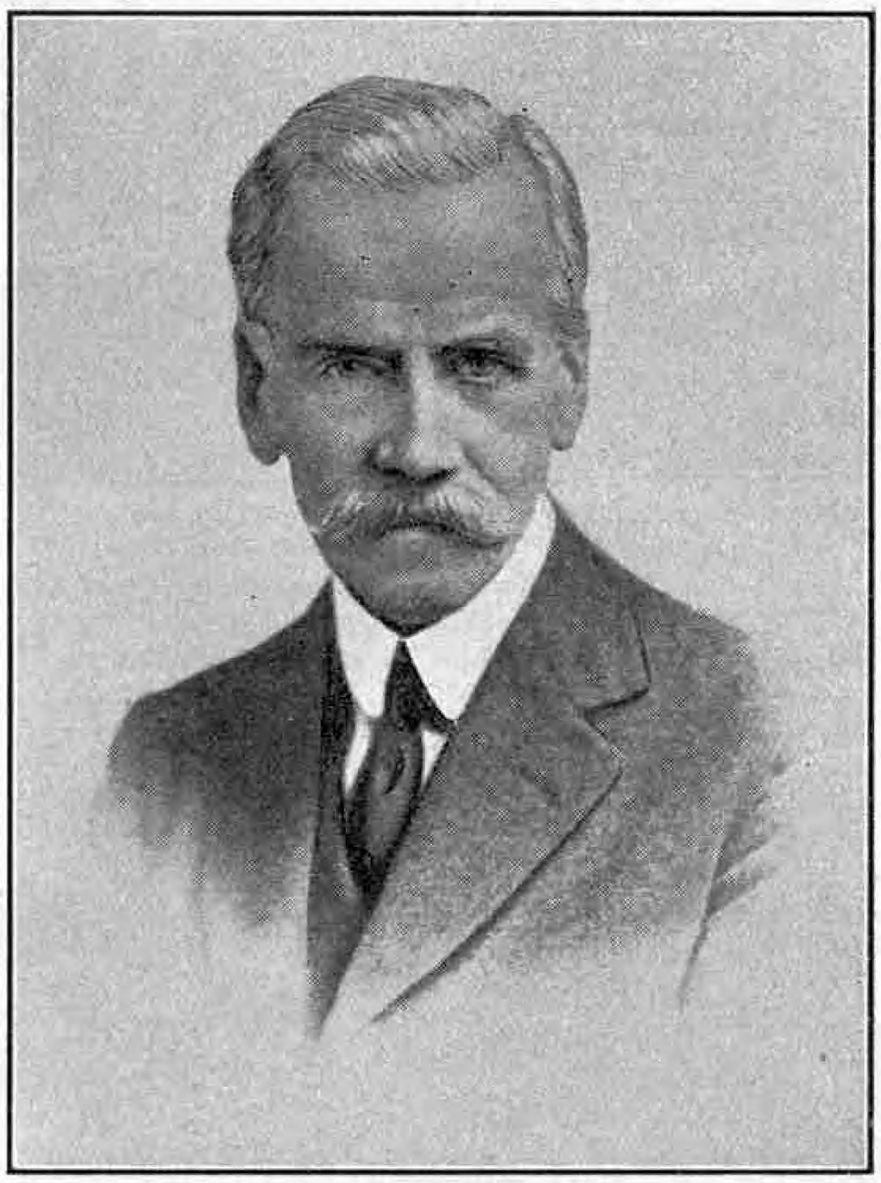
If we measure the wheel now we shall find that it is smaller than the wood pattern. The metal, as it cooled, has contracted, but the pattern was slightly larger than the correct size, so that the metal has contracted to the proper dimensions.

Sir Basil Mott

A Pioneer of Underground Electric Railways

FOR the last 200 years Great Britain has been a land of great engineers. The earliest of these were such pioneers as Brindley, the wheelwright who constructed the Bridgewater and other canals; Telford, the Scottish working mason who became one of the greatest builders of roads and bridges; and Stephenson, who began his career as an engine brakesman and became our greatest railway builder. All these men were daring and original and full of constructive ideas, and they have been followed by others, who have not only built bigger and better than their predecessors, but in their turn have invented new methods and have never been afraid to strike out on new lines. One of the most capable and original of these was Sir Basil Mott, who died on 7th September last after a long and successful career.

Mott was born at Leicester on 16th September 1859, and underwent a training as an engineer at the Royal School of Mines, London. For several years afterwards he worked as a mining engineer in various collieries, and this is of special interest, because from this modest beginning he gained the knowledge and experience that he afterwards put to good use as a pioneer of underground railway construction. His introduction to this work came when he attracted the notice of Greathead, the inventor of the shield used in tunnelling work in clay or mud. At that time Greathead was about to construct the first section of the City and South London Railway. then known as the City and Southwark Subway, in which his system of shield tunnelling was employed for the first time on a large scale; and he appointed Mott, then only 25 years old, resident engineer on the line.



Sir Basil Mott, Bt., 1859-1938.

It is difficult for us to realise how crude were the means of travel then available in London. There were buses, drawn by horses, but these were slow and uncomfortable. Londoners also had begun to burrow underground, for the Metropolitan Railway had been opened from Bishops Road to Farringdon Street in 1863; but the tunnel was not well ventilated, and smoke and grime from the locomotives made travelling underground a very unpleasant experience. The construction of the City and South London Railway changed all this, and Mott played a great part in the movement. In spite of his youth, he carried out this pioneer work of driving a tunnel at a deep level with complete success, and when the railway was opened for traffic he actually took charge of running operations. This was almost a more difficult task than the constructional work had been, for electric trains were then new and untried, and troubles continually arose. He successfully blazed the way for the new form of transport, however, and there was such a rush to follow the example thus set that 17 new tubes were authorised in the next 10 years, and the modern era of swift movement by electric trains in tubes at great depths underground was firmly established.

By this time Mott had entered into partnership with Sir Benjamin Baker, the designer of the Forth Bridge; and in new work in many branches of engineering he proved to be as sound and original as in burrowing underground. His first task for instance as a bridge engineer was the widening of Blackfriars Bridge, London, the entire responsibility of which fell to him owing to his partner's death just when the work was beginning.

When the War came Mott found himself employed on work of an entirely different kind in connection with defence schemes in France, and his engineering service during that period took him as far afield as India. When peace was restored he was in great demand for a variety of engineering projects, and he has left his mark in many different parts of this country, generally in the shape of great bridges. With his partners he was responsible for, among other structures of this kind, the Southwark Bridge over the Thames, the handsome Queensferry Bridge near Chester, and the new Tyne Bridge at Newcastle, and the vertical lift bridge over the Tees at Middlesbrough, the first of its kind to be constructed in this country. He was the chief engineer for the construction of the great road tunnel under the Mersey between Liverpool and Birkenhead, the largest underwater tunnel in the world. The successful conclusion of such a mighty work as this tunnel alone would have been sufficient to make the reputation of any engineer, but was only a comparatively small part of Mott's achievement.

One particularly interesting piece of work that he was responsible for, and one which weighed more heavily upon him than the construction of all the bridges and tunnels with which he was concerned, was the preservation of St. Paul's Cathedral. He was chairman of a committee of engineers and architects appointed 12 years ago to see what could be done to preserve this famous structure, then giving rise to great anxiety. The plan adopted was to grout the piers with cement, and this and other work carried out with the greatest care and thought was entirely successful in its aims.



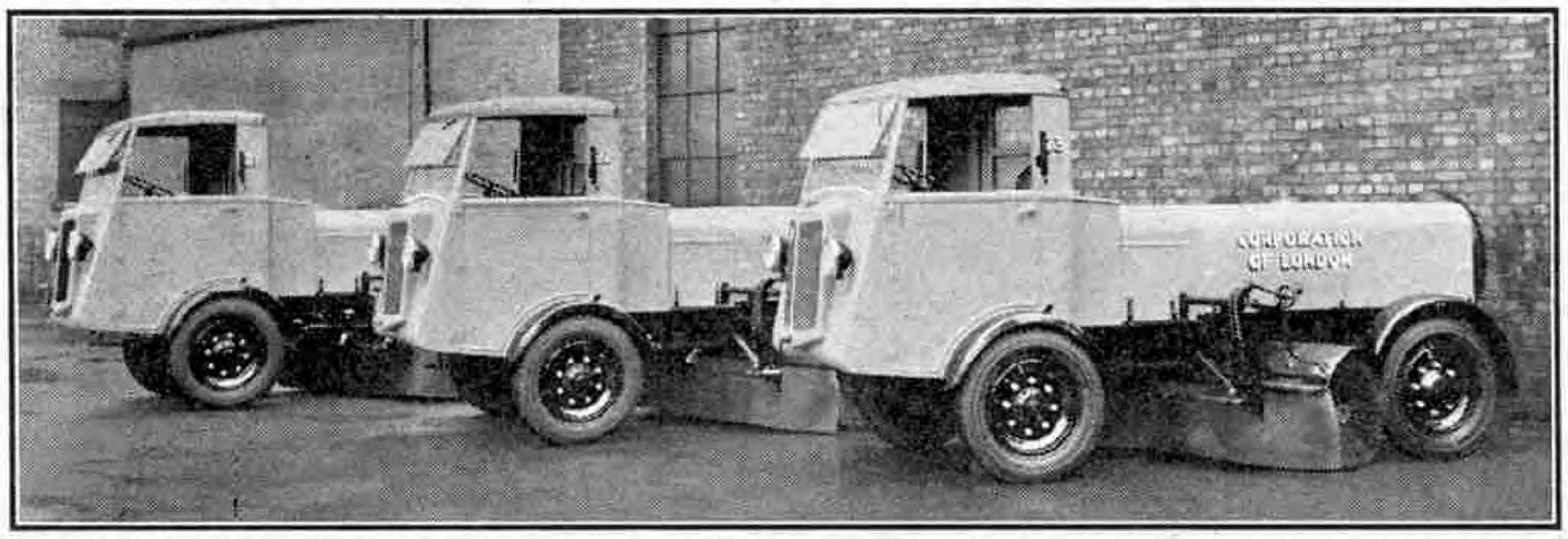
A Novel Staff Locator for Factories

One of the problems met with in many large factories, works and stores, is that of locating important officials quickly when they are required to attend to urgent business in the office. In many places sound signals in code are transmitted by loud speakers in all shops and departments, but in others it is necessary to send out messengers to find the wanted official.

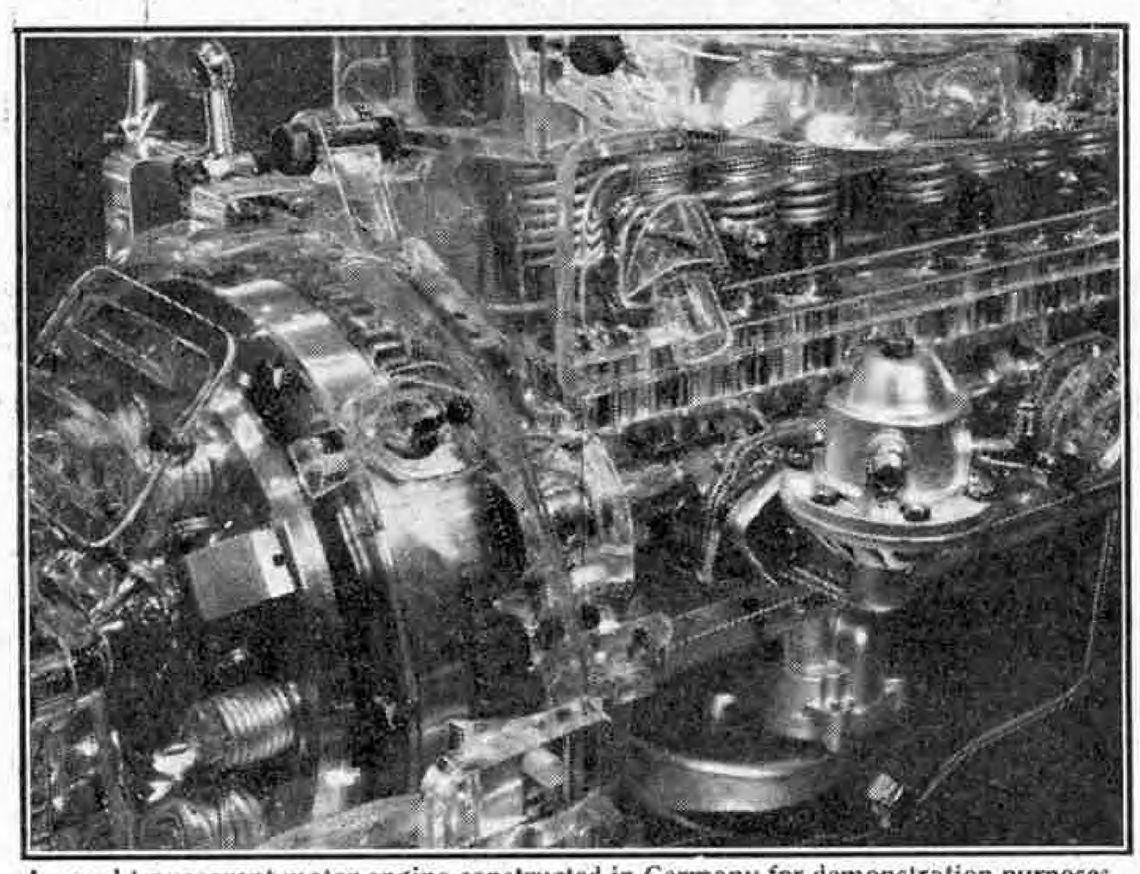
A novel electric signalling system has now been produced by Gent and Co. Ltd., Leicester, for this purpose. Under this scheme each official has a special identifying colour or combination of colours allotted to him, and his name is engraved on the dial of an electric transmitting instrument. When he is required the works telephone operator, or some other person specially appointed, simply rotates the control knob of the transmitter to the position bearing his name and then presses it. Lights of his identifying colour are then shown in all the departments of the works. When the knob is pressed still further a sound signal draws attention to the coloured lamps, and the individual sought proceeds to the nearest internal or house telephone, or to his office.

Parachuting in Safety

Visitors to the New York World's Fair next year will be able to enjoy the thrills of parachuting without exposing themselves to any of its attendant dangers. This will be made possible by a giant parachuting tower, 280 ft. in height, which is being erected in the Fair grounds. At the top of the tower will be a number of steel arms radiating outward like the spokes of a wheel. From the outer ends of the arms steel guide wires will extend to the ground, and down them parachutes 32 ft. in diameter will slide. There will be no necessity to pull the rip cord, for the canopies will be held permanently open by means of metal spreaders. Passengers will be held securely in a double seat, and shock absorbers will ensure a comfortable landing.



Three Karrier "Bantam" road sweepers supplied for use in the streets of London. The machines can sweep a 6 ft. 5 in. width of roadway at a speed of 8 m.p.h. Photograph by courtesy of Karrier Motors Ltd., Luton.



A novel transparent motor engine constructed in Germany for demonstration purposes. Photograph by courtesy of Bauer and Schaurte, Neuss, Germany.

A Transparent Motor Engine Model

The lower illustration on this page shows a transparent model of a standard motor car engine, which was exhibited at a German motor exhibition by Bauer and Schaurte, Neuss, Germany. The model is constructed of "Crystall," one of the new transparent synthetic materials, and its object is to show the great advantage of using high-tensile bolts when it is desired to reduce weight without in any way lessening strength. Two models of transparent material actually were built, one showing the use of high-tensile bolts and the other of the old-fashioned low-tensile bolts of larger diameter. The saving in weight and dimensions that is effected by the use of special bolts was thus made evident.

A Power Station Built in a Dock

Dr. E. L. Burgin, Minister of Transport, recently performed the opening ceremony at the inauguration of the No. 2 power plant of the great Clarence Dock power station, Liverpool. The first portion of the plant, known as No. 1 Station, has now been in operation for about seven years. The total capacity of the station is now 200,000 kW.

The Clarence Dock power station is unique in that it is probably the only public supply plant in existence actually built in a dock. The Clarence Dock site was chosen on account of its nearness to the River Mersey, and the saving in excavation work for the foundations. The generating plant in each of the two stations consists of two 50,000 kW turbo-alternators. Actually the four sets are housed in one room, and the two stations are differentiated by their boiler houses, which have different steam conditions. The boilers in No. 1 station supply steam at a pressure of 450 lb. per sq. in., while those in No. 2 Station operate at 630 lb. per sq. in.

The two great concrete chimneys of the boiler houses, which are a conspicuous feature from the Mersey, are believed to be the largest, although not quite the highest, in the world. Each is 335 ft. high, has greatest and least diameters of 28 ft. and 25 ft. respectively, and weighs 4,400 tons.

Tallest Lock Gates

Giant gates provided for the lower ends of the lock at the Bonneville Dam, in the United States of America, are the tallest ever constructed. Each leaf weighs 600 tons and is 100 ft. high. Yet they are built and hung so accurately that when they are closed they form a metal-to-metal union that is perfectly watertight.

Gates of similar type 46 ft. high are used at the other end of the lock, which is 76 ft. wide. Each leaf of both the upper and lower gates is about 44 ft. in width.

A Fine Peruvian Bridge

High up on the lower slopes of the Andes, the Peruvian Central Railway crosses the Verrugas Gorge, a deep ravine that derives its name from a deadly disease known as verrugas that is transmitted by the bite of a minute mosquito-like insect. This venomous midget is active only during the hours of darkness; in daytime the locality is quite safe, but after sundown no Europeans and few natives venture to remain in the neighbourhood.

The first bridge across the Gorge was built in 1872, when the railway was constructed. It was destroyed in 1890 and replaced by a cantilever bridge, carried on light steel trestles. In 1906 a falling boulder damaged a leg of one of the trestles, however, and a few years later the safety of the bridge was further endangered when another boulder of enormous size, high up the mountain side, was partially uncovered by rains and threatened the bridge with destruction. As any attempt to shore up the boulder would have entailed excavation below it, thus risking disturbing it, little could be done to safeguard the structure and in 1935 it was decided to erect an entirely new bridge. This is shown in its completed state in the upper illustration on this page.

The new bridge carries a single line of railway of 4 ft. 8½ in. gauge, and is about 720 ft. long. It comprises a centre span 230 ft. in length, two main side spans each measuring 181 ft., two tower spans of 30 ft., one approach span of 66 ft. and two steel towers approximately 80 ft. in height.

During the erection of the first bridge across the gorge verrugas killed many of the engineers and workmen. The men engaged in the construction of the new bridge were transported every evening to sleeping quarters some distance from the site, with the result that no fatal cases of the disease were recorded.



The fine new bridge that carries the Peruvian Central Railway across the Verrugas Gorge in the Andes. It was constructed by the Cleveland Bridge and Engineering Co. Ltd., Darlington, to whom we are indebted for our photograph.

Transmitting Photographs in Russia

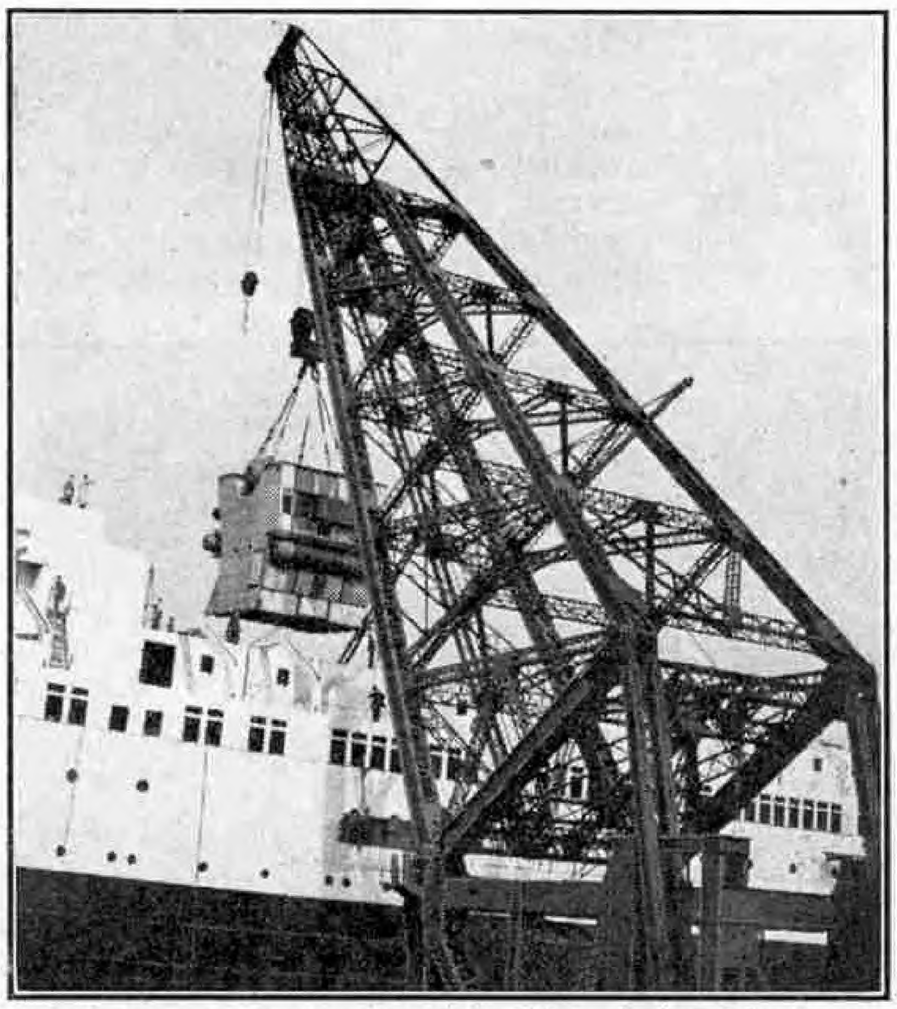
From January 1st to September 1st this year, Moscow transmitted and received over 400,000 photo-telegrams. The city now has regular photo-telegraphic communications with 12 important cities of the Soviet Union and radio-photograph communications with four. In addition a new photo-telegraphic line is being constructed between Moscow and Gorky, and two other lines are to be provided between Moscow and Kuibyshev and Moscow and Odessa. All three lines will be put into operation this year.

Stopping the World's Fastest Car

In the course of tests made by Ferodo Ltd., who are the manufacturers of the clutch and brake linings fitted to Capt. Eyston's speed car *"Thunderbolt,"* it was discovered that the braking force required to stop the car during its record-making run over the salt beds at Bonneville, Utah, U.S.A. recently would be sufficient to lift a fully-loaded double-deck bus to the top of Snowdon!

A New Electric Piano

A new type of piano has been produced that can be used either as an instrument of the ordinary kind, or as one in which sound is converted to electrical energy and reproduced through a loudspeaker. Between each pair of strings is mounted a small metal stud, somewhat like the head of a woodscrew. This acts in exactly the same way as a pick-up fitted to a wireless set, and when it is connected to the amplifier the notes of the vibrating strings are reproduced through a loudspeaker. The volume can be regulated as desired by means of a volume control similar to those used in radio receivers, which is fitted at the side of the keyboard.



A floating crane lowering one of six 110-ton boilers into the new "Mauretania," now being completed at Cammell Laird's Shipyard, Birkenhead. Photograph by T. C. L. Hutchinson.

Marconi's Yacht to be a Radio Museum

The Italian Government is considering a scheme to convert the late Senator Marconi's yacht *"L'Elettra"* into a floating radio museum. It was on board this yacht that the great inventor carried out many of his experiments in wireless communications.

A Metal of the Future

There is to-day a big demand for such metals as aluminium and magnesium, and it seems likely that light metals will gradually supersede the heavier metals in many branches of industry. In addition to their very valuable physical and chemical properties light metals have the advantage that the raw materials necessary for their production are found in abundance in widely scattered parts of the world, in many of which the heavier metals such as iron and copper are comparatively rare.

One of the light metals that is now coming into considerable use in many branches of engineering is magnesium. This metal is about one-third lighter than aluminium, and is the lightest of all structural metals. It is adaptable for use in every branch of engineering in which light weight combined with considerable strength is required, and during recent years considerable improvements have been made in methods of casting, forging and heat-treating the metal and its alloys. At present most of the world's supply of magnesium comes from Germany, but the United States, Great Britain, France, Japan, Soviet Russia and Austria are all producing increasing quantities.

Gas Generator Road Vehicles

Interesting tests have been carried out in Russia recently with 12 motor vehicles operating on generator gas. In a period of 53 days the vehicles covered a distance of 6,770 miles. They crossed the Ural mountains twice in addition to traversing the salt marshes of Kazakhstan, the Ukrainian steppes and the forests of White Russia, and they are stated to have given a good performance. It is likely that vehicles of this kind will become one of the chief means of transport in Russia, where the timber from which the gas is produced is so plentiful, and more than 19,000 similar vehicles are to be built before the end of next year.

Fitting the New *"Mauretania's"* Boilers

The first of her six great boilers was recently installed in the new Cunard White Star liner *"Mauretania,"* now being completed in Cammell Laird's shipyard, Birkenhead, and the lower illustration on this page shows a giant floating crane hoisting it into position for lowering 110 ft. into the depths of the vessel. This is the heaviest boiler ever fitted on Merseyside. It is of the high pressure water-tube type, fitted with three water drums and five oil burners, and is 24 ft. high and 20 ft. long. Its weight is more than 110 tons.

Lifting the boiler and manœuvring it into position for lowering into the vessel's boiler room was the heaviest task yet undertaken by the floating crane. The boiler was taken inch by inch from the boiler shop where it was made, and was moved on a truck to the dockside, where it was picked up by the crane.

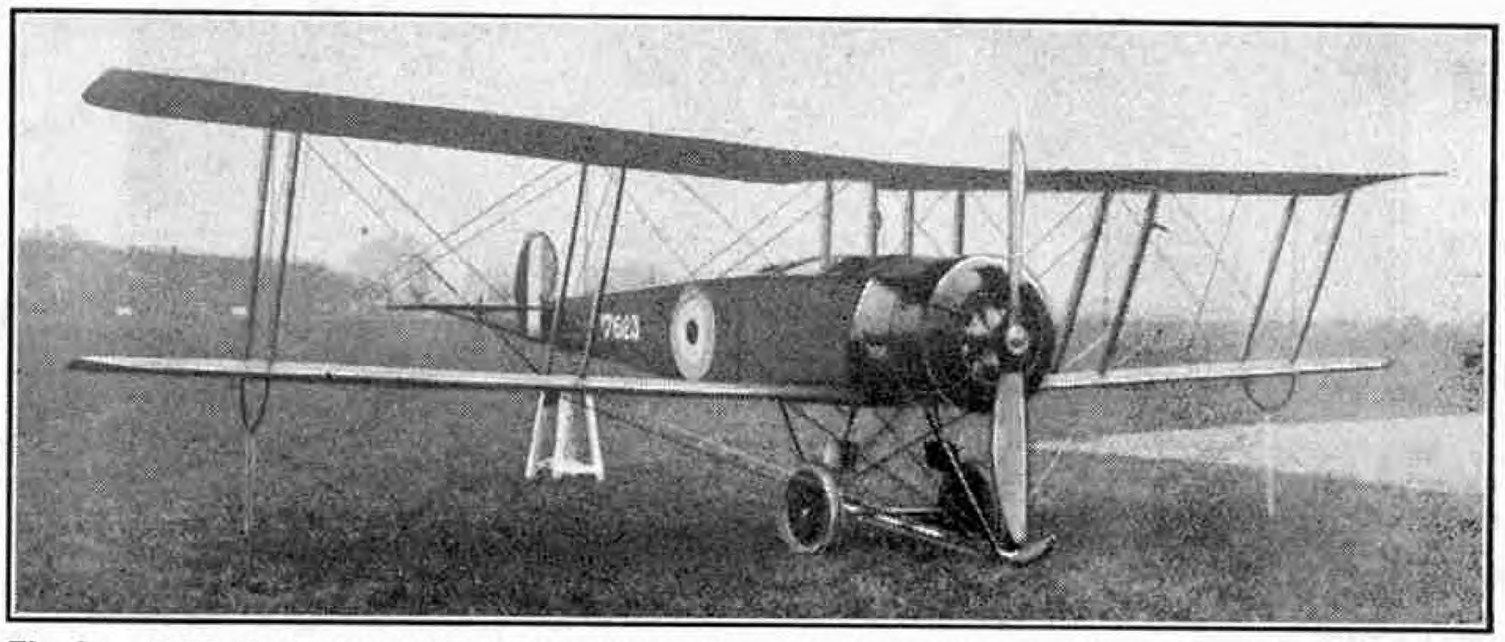
An Aeroplane That Has Made History

Avro Trainer Celebrates its 25th Birthday

By Robert Polendine

IF aeroplanes possess the personalities with which ships are credited, then there is at least one type of British light aeroplane whose memories have made history.

This year the Avro 504 has celebrated its silver jubilee, not as a museum piece, but as a regularly operating commercial aeroplane. It is a quarter of a century since this historic aircraft first came to life at Brooklands. Since then it has seen active service in the Great War, where it distinguished itself by at least two spectacular exploits, and, after a fifteen years' career as the standard training aeroplane of the Royal Air Force, it is still being widely employed commercially for joyriding and advertising purposes.

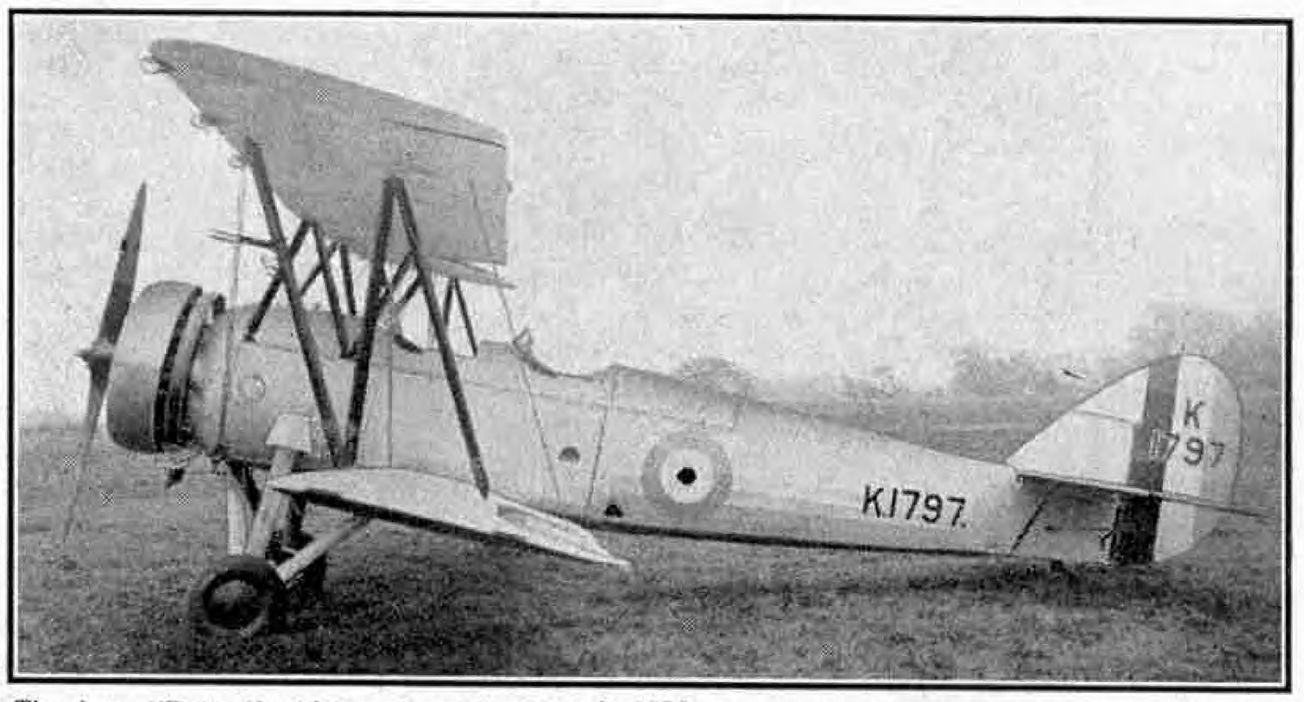


The Avro 504K, the famous British wartime trainer. The protective cowling over the engine and the long central skid are typical of early Avro design. Photographs by courtesy of A. V. Roe and Co. Ltd.

Many people had their first "flip" in an Avro 504 when the "flying circus" became a familiar feature of every seaside resort just after the war. But probably few of them realised that these docile craft were of the same type as those that carried out the memorable raid on the German Zeppelin sheds at Friedrichshafen in November 1914, and which Comdr. Bigsworth flew when he brought down the first Zeppelin at Nieuport six months later.

The 504 was first tested at Brooklands in the summer of 1913. It was this type that introduced the well-known Avro features, the tall undercarriage, the curious rounded tailplane-cum-rudder, and the familiar wing stagger. For over 25 years these characteristics have been handed down to its descendants, and the wing stagger still persists in the latest cleaned-up version of the Avro Trainer—the "Tutor" of Central Flying School fame.

The original 504 was actually one of the earliest of man's successful attempts at flight, for the Wrights had made their first flight only four years before. It was powered by an 80 h.p. Gnôme rotary; but this engine never developed its rated horse-power, and it was later replaced by the supposedly more powerful Monosoupape Gnôme when the Avro was modified for seaplane conversion. But the Monosoupape was notoriously unreliable, and was finally responsible for the abrupt ending to the 504's career. It was crashed at Shoreham in a forced landing caused by engine failure while flying over land with a float undercarriage.



The Avro "Tutor," which replaced the 504N in 1932 and became a popular trainer. It has inherited the familiar wing stagger of earlier Avro types.

But the first 504's brief career had proved the soundness of its design, and orders for production models were placed by the War Office and Admiralty. On the outbreak of war it took its place amidst the many types that were hastily developed for military purposes. It was too slow ever to be a real fighting machine, but was used nevertheless for a variety of purposes during the early stages of the war, including gun spotting, reconnaissance, photographic work and light bombing. The only armament was the pilot's pistol and an ordinary rifle carried by the observer.

The story of the attack on the Zeppelin sheds is not widely known. It was carried out with the utmost secrecy. Four 20-lb. T.N.T. bombs and four petrol incendiaries were carried by each machine. Bomb racks were then unknown, and improvised carriers were rigged up under the wings. In the absence of any dummies, live bombs had to be used for testing the bomb carriers, and it was so arranged that they fell harmlessly on to sacking suspended underneath.

The Avros were dismantled and taken to the South Coast, where they were shipped across to Le Havre and on to Belfort. Here they were re-assembled, and their engines run up in a balloon shed. Their first flight after assembly was straight to their objective, the Zeppelin sheds at Friedrichshafen, where two of the pilots accomplished their mission. The third machine was forced down by a shattered petrol pipe.

Comdr. Bigsworth's exploit, although less spectacular than Warneford's later Zeppelin "strafe," was no less effective. Flying the 80 h.p. Gnôme-powered Avro, he found a Zeppelin near Nieuport, climbed above it and dropped his four bombs through the envelope. The impact was not sufficient to explode them, but they did enough damage to force the Zeppelin down. This was the first successful attack on a Zeppelin by a British aircraft.

With the increasing speed of aerial combat, the Avro 504, never a fast machine, was withdrawn from the fighting line and used for training purposes. For some months it shared this duty with several other types, notably the Maurice Farman and B.E., until in 1917 it was decided to standardise the training system by adopting one particular type of instructional machine.

The aeroplane chosen was the 504 J, not so much on account of its pleasant flying qualities as for its useful vices. Substantially the same as its prototype, the 504, but employing the 100 h.p. Monosoupape Gnôme, it possessed many of the habits of the faster single-seater scouts. The tall undercarriage and narrow track, together with the use of a large rotary engine, resulted in a disconcerting "torque effect," especially on landing and taking off and during aerobatics. But this nose-swinging tendency, and the lightness of the controls, were found to be an excellent cure for the clumsiness that might have had fatal consequences in the handling of high-performance single-seaters, in some of which the gyroscopic effect of powerful rotary engines was uncomfortably pronounced.

Opinions varied enormously as to the 504's flying manners. Although many pupils found the sensitiveness of the controls very trying, there were some instructors who believed it so easy to fly that experimental modifications were actually carried out to make it more difficult to handle. And even to-day there are many older pilots who would rather tackle a forced landing with the 504 than with any other type, owing to the exceptionally

(*Continued on page 738*)



Puzzles

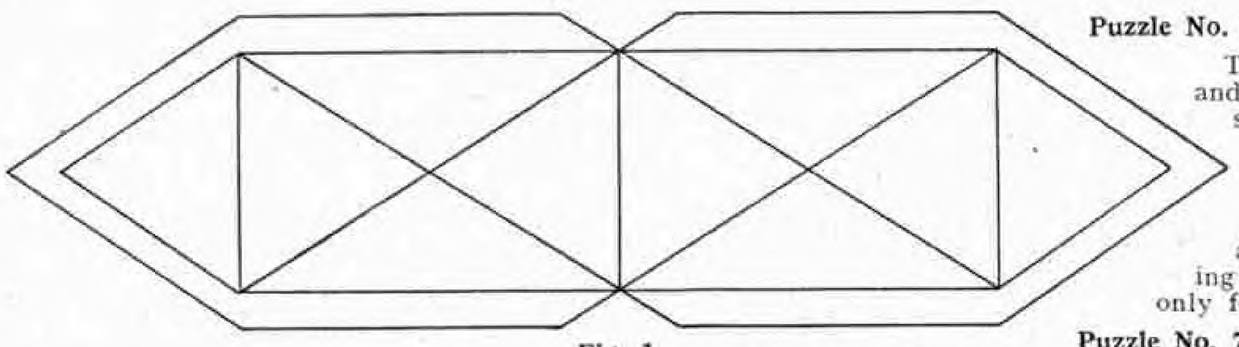


Fig. 1.

Puzzle No. 1

Take a look at Fig. 1 and then try and draw the design without lifting your pencil off the paper or going over any line twice.

Puzzle No. 2

Ask your friend to take a book, and open it at any page. Then tell him to choose a word in the first nine lines, not later than the ninth word on a line. Next he must multiply the number of the page by two, add five, and multiply the result by five. Add the number of the line, multiply by ten, and then add the number of the word. Finally he must subtract 250.

Get him to tell you the result of this, and from it you can point out the word he chose. Try it, and see if you can find the solution. It's quite simple!

Puzzle No. 3

Puck once boasted that he could put a girdle round the earth in 40 minutes. We have reason to believe that he attempted to do so, making a steel girdle that would fit round the Equator, touching it at every point. Being a rather hasty young person he miscalculated the required length, and made it six yards too long. When he came to fit it on the Equator he found that it remained some distance away from the Earth's surface. Can you find out what this distance was, assuming it was the same all round the Earth?

Puzzle No. 4

Cut a piece of cardboard to the shape shown in Fig. 2. Then by means of two straight cuts, divide it into four pieces that when placed together in a certain way form a perfect square.

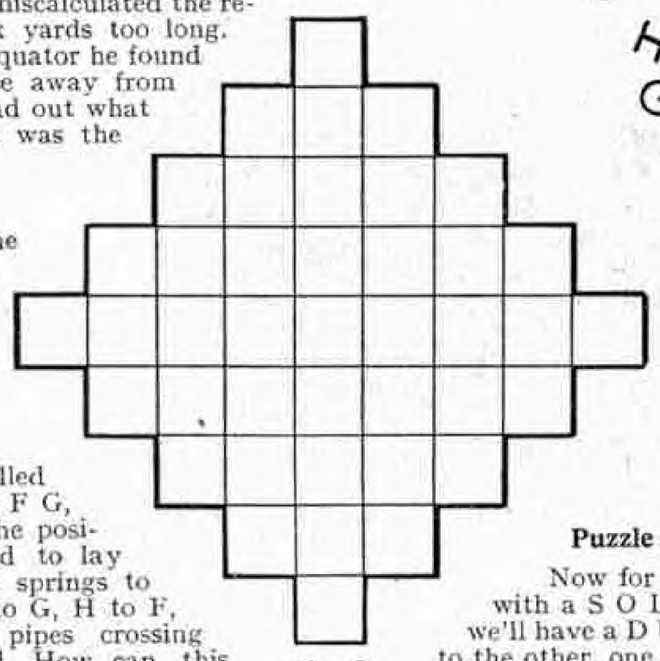


Fig. 2.

Puzzle No. 5

In Fig. 3 A B C D is a walled space. In it are three houses, E F G, and three springs, H I K, in the positions indicated. It is required to lay pipes to carry water from the springs to the houses, I being connected to G, H to F, and K to E, without the pipes crossing or passing outside the wall. How can this be done?

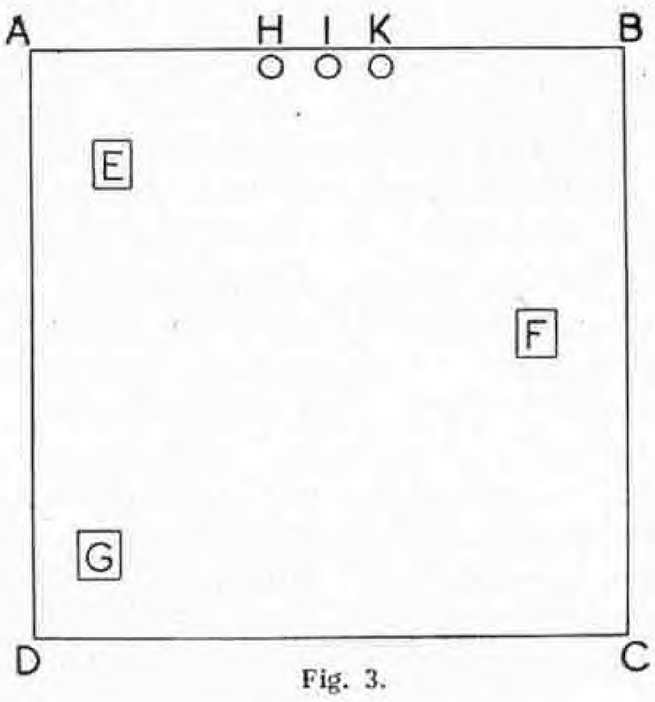


Fig. 3.

Puzzle No. 6

Take 20 matches and arrange them as shown in Fig. 4. In this there are four triangles. Can you make 15 triangles by changing the positions of only four matches?

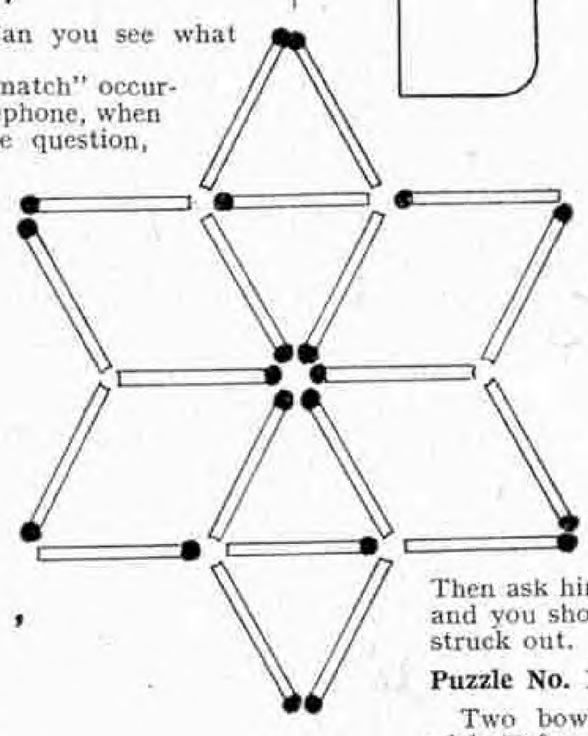


Fig. 4.

Puzzle No. 7

Here is a silly conversation. Can you see what is wrong with it?

A telegram in which the word "match" occurred was being dictated over the telephone, when the operator interrupted with the question, "What is that word? Will you spell it please?" The sender replied: "M for Mary, A for Anne, T for Tom, C for Charlie . . ." Again the operator interrupted, with the question "C for what?" "C for Charlie," the sender repeated, and finished with "H for Harry."

Puzzle No. 8

An envelope addressed as shown in Fig. 5 was sent through the post. Can you read the address?



Fig. 5.

Puzzle No. 9

Now for a musical puzzle. Let's start off with a S O L O. Ah! Here's someone else, so we'll have a D U E T. Can you change from one to the other, one letter at a time, in seven steps? But a moment. Here's another, so we've got a T R I O. Good gracious, they've all arrived now, and we have a whole B A N D. See if you can do the same here, making seven one-letter changes.

Puzzle No. 10

A builder put up a row of houses, and numbered them up to 50. He put metal figures on each gate to indicate the number of the house. Can you say quickly how many figure "4s" he used?

Puzzle No. 11

In Fig. 6 are shown three white counters and three black ones on a board divided into seven sections. Can you transfer the black counters to take the places of the white ones, and vice versa? Only one counter must be moved at a time, and only through one space, but if a counter is divided from a vacant space by a single counter it may pass over to that space, the movement being similar to that of "taking" a man in the game of draughts. Black counters can only be moved to the left, and white to the right.

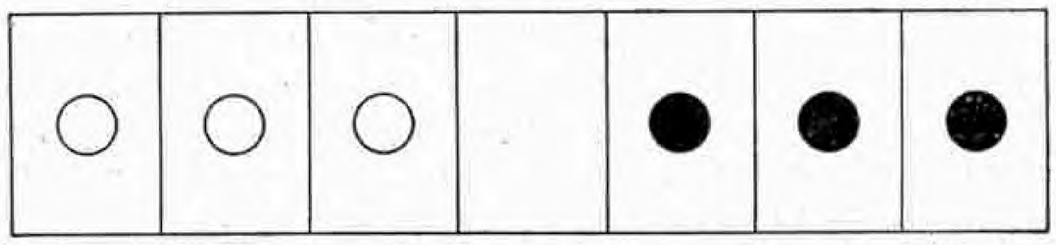


Fig. 6.

Puzzle No. 12

Can you read the phrase given in Fig. 7?

Puzzle No. 13

If you don't do your homework, you have to "face the music" next morning. In our case it was rather different. We were given the "simple" addition sum shown below, and told that "A" was 6. Can you help us out by filling in the figures?

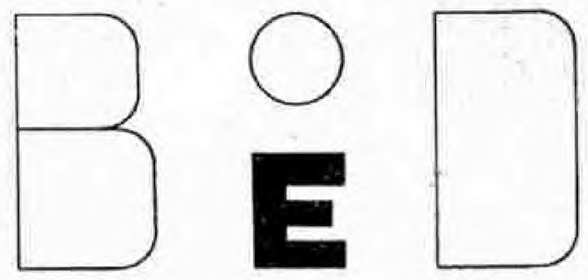


Fig. 7.

FACE
THE
MUSIC

Puzzle No. 14

Here's another one to mystify your friend. Ask him to write down a number, with as many digits as he likes. Tell him to multiply it by nine, and strike out from the result one figure. Then ask him the sum of the figures remaining, and you should be able to tell him the number struck out.

Puzzle No. 15

Two bowlers each had an analysis of 28 wickets for 60 runs one match before the end of the cricket season. In the last match one bowler took one wicket for 27 runs, and the other 4 wickets for 36 runs. The second bowler was being congratulated on heading the season's average, when a spectator who calculated the averages of both pointed out a curious result. What was this and how is it explained?

Puzzle No. 16

Can you place pins in six of the black dots in Fig. 8 so that there is no more than one pin in any of the lines making up the figure, either vertical, horizontal or diagonal?

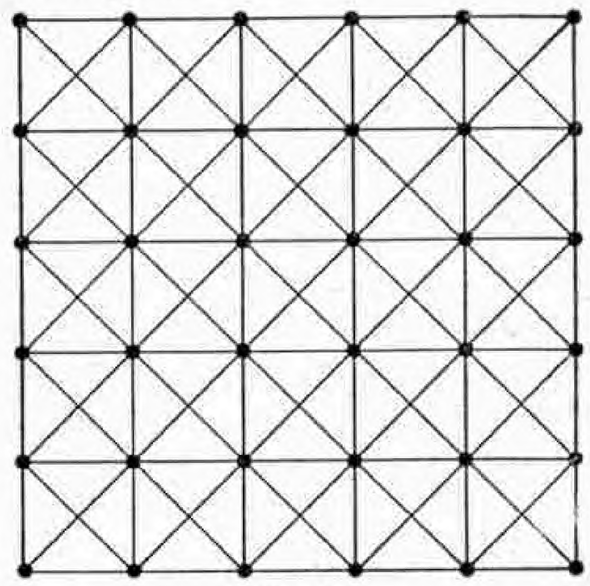
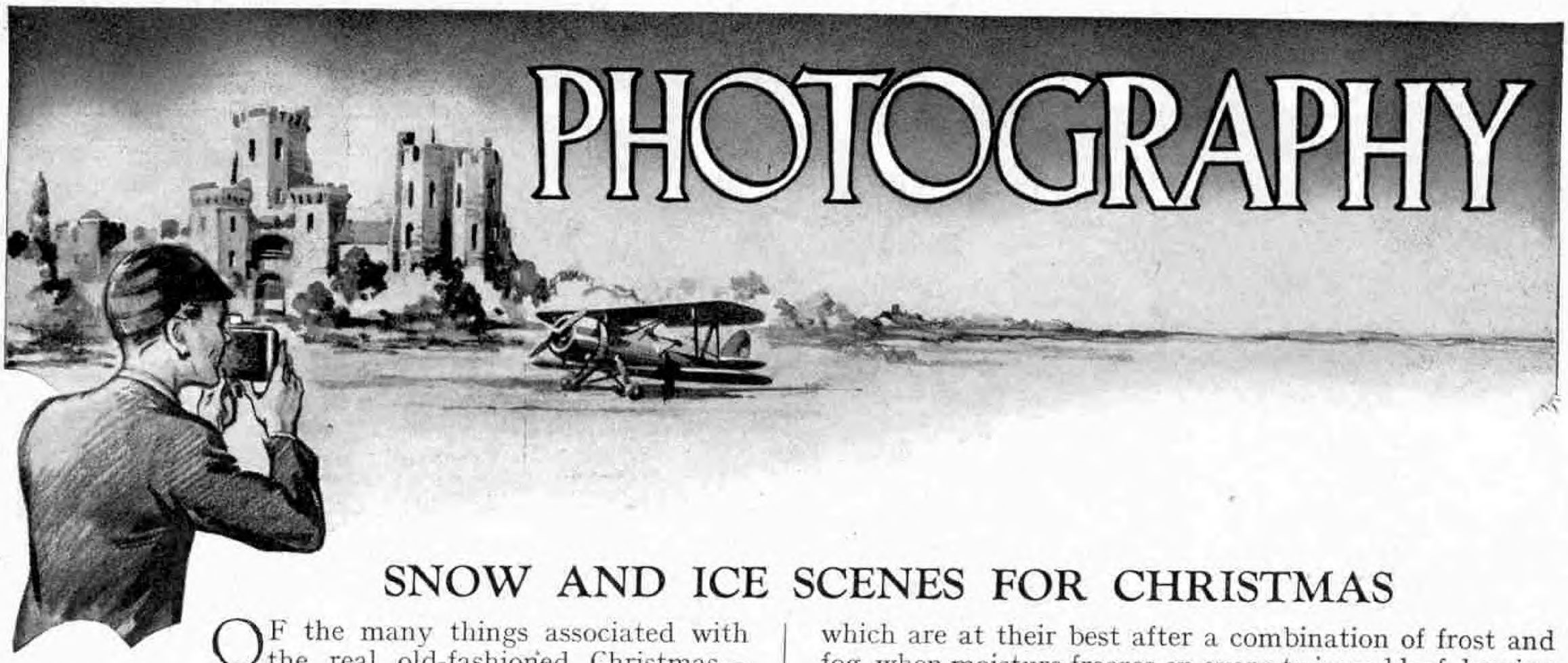


Fig. 8.



SNOW AND ICE SCENES FOR CHRISTMAS

OF the many things associated with the real old-fashioned Christmas—turkey, mince pies, holly and mistletoe—one of the best helps to its enjoyment is snow, or at least frost, both of which transform a bleak and dreary countryside into a veritable fairyland that provides photographers with almost unlimited subjects for beautiful pictures. Snow and frost photography indeed is one of the most fascinating pursuits, for the scenes themselves are strange and the lighting effects unusual, while the rarity of opportunity to indulge in this branch of the hobby adds to its delights. Every owner of a camera can take part in it, whether with the object of securing interesting and attractive pictures, or of photographing some well-known place in its winter garb for comparison with the scene at other seasons. Christmas, the traditional season of snow and frost, is the time to consider how this is to be done, and perhaps this year we may be fortunate enough to be given the opportunity to put our ideas into practice and obtain some good pictures.



Sedges at the margin of a pond photographed during a severe frost. This illustration and the upper one on the opposite page are from photographs by H. Bastin, Reading.

Any kind of camera is suitable for this work, but it is best to use orthochromatic plates or films and, whenever possible, a colour screen or filter in order to capture the effect of sunshine on the snow, and also to assist in giving the correct tone to the sky if part of this is included in the picture. Only those whose attention has been drawn to the point realise how dark an average sky appears in comparison with a wide expanse of newly fallen snow in a photographic print.

By far the best snow pictures are made first thing in the morning, before the powdery coating on the twigs and branches has been disturbed by the wind and when the Sun's rays are breaking through the mist; the chance of getting good photographs makes it worth while to go out before breakfast, for in those first hours even a town garden will provide prettier and more artistic pictures than will be obtained by going farther afield later in the day. These remarks apply equally to frost landscapes, which are at their best after a combination of frost and fog, when moisture freezes on every twig and leaf, leaving them covered with delicate traceries of ice.

Most photographs of frost and snow scenes are greatly improved by careful planning of the viewpoint so as to include in the picture a sharply-defined foreground. This effect can be secured most conveniently by including an overhanging branch of a tree, and should not be difficult to arrange in any orchard or small plantation.

The average snow and frost scene depends for its beauty upon variety in combinations of light and shade. Thus either a bold sweeping landscape or small portion of a snow-laden garden may be photographed with equal success. The only essential requirement in each case is a heavy fall of snow—not a brief "half-hearted" affair, but a genuine old-fashioned downfall that clothes the earth in a mantle of billowy whiteness. If the picture is to be really successful it must include some contrasting dark subject to set off the brightness of the snow. The best method is to choose a subject in which there are some moderate darks to give the desired effect. The dark areas should only be moderate, though, and large and really heavy shadows should be avoided. Another method of obtaining contrast in the picture is to use a very pale yellow filter to subdue the strong blue light from the snow. If possible choose a moment when the air is still to make the exposure, for then there is a peaceful calm among the trees and little likelihood of their feathery load being disturbed.

Owing to the quantity of light reflected by the snow, and the general absence of heavy shadows, the exposure required to produce a good negative is comparatively short. Usually an exposure of from 1/10 sec. to 1/40 sec. at F/8 is satisfactory, but it is best to use an exposure calculator or meter if one of these is available. The time of development of the plate or film too should be rather shorter than normal in order to secure a negative that is full of detail, but thin and without harsh contrasts. Over

development of snow scenes is fatal, as all the detail is lost in the high lights and the resulting prints are too contrasty.

One other point that may be mentioned is the desirability of maintaining the various solutions used for developing and fixing the negative at approximately similar temperatures. There is a greater difference than might be imagined between the temperatures of water drawn from the tap and water that has stood for some time in a vessel in a warm room, and in prolonged frosty weather, when water in the pipes becomes really cold, it is better to wash films and prints in six or even more changes of water that has been standing in the room for some time.

Negatives of snow or frost scenes print best on gaslight or bromide paper. Such prints give the black-and-white effect required, and it is obvious that the brown or purple of P.O.P. or self-toning papers are quite out of place for snow scenes.

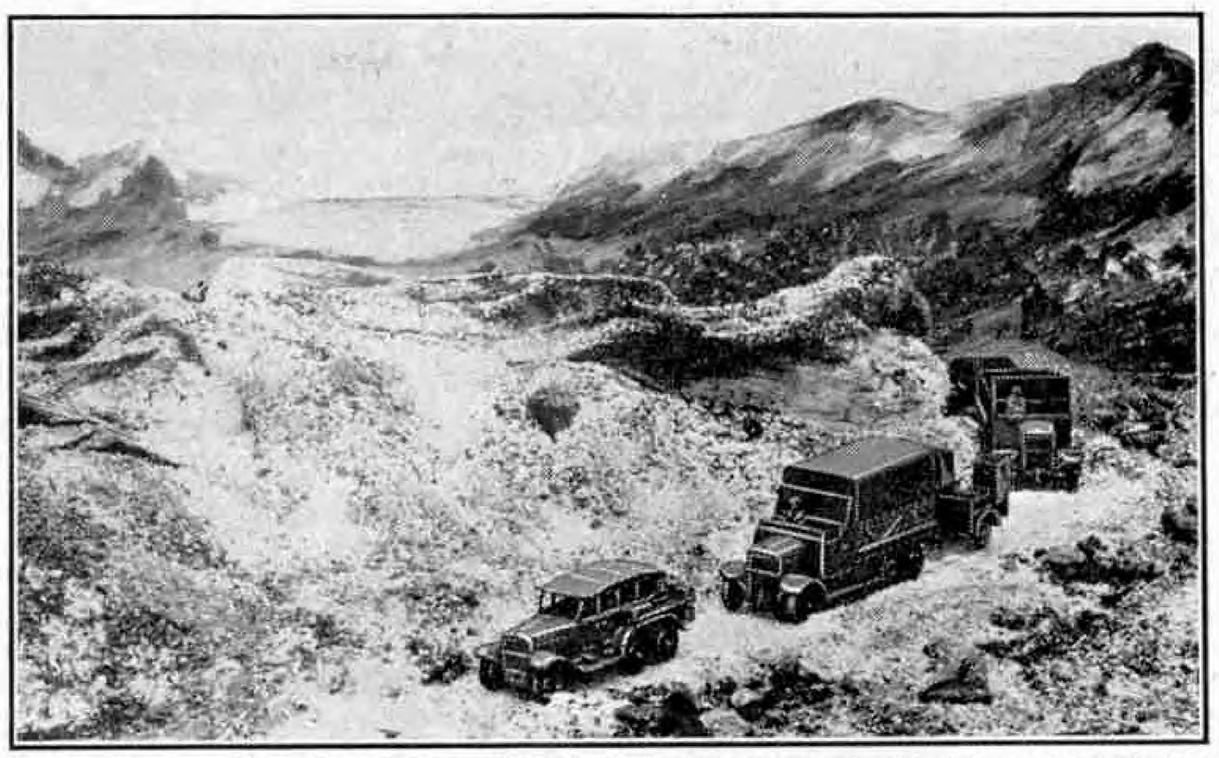


A realistic Alpine scene reconstructed on a table top from a few pieces of coal, some alum, and a small doll's house.

Even if Christmas does not bring snow and ice with it, photographers will still be able to produce what appear to be seasonable photographs by arranging scenes of this type for themselves! Excellent snow pictures can easily be taken by the table-top photographer, as the Alpine scene shown in the upper illustration on this page shows, and building up the scene and taking the photograph itself will be really good fun.

The mountains in this fine example of miniature photography are made up of carefully selected lumps of coal, which serve as rocks, and the snow is represented by a handful of alum. A search in the toy cupboard produced a doll's house that just fitted into the general scheme. Common salt also can be used as snow.

The most beautiful ice spangles and patterns are formed on window panes during frosty weather, and no photographer should fail to make pictures of them. The two essential technical points in this work are the provision of a dark background and back lighting, and a properly exposed negative made under these conditions shows the tiniest details of the patterns in brilliant contrast.



Another fine example of table-top photography. How this was produced is explained in the accompanying article.

The best way to secure a dark background for the window pane is to take the photograph at night from the inside of the house. The window pane must be lighted from the back in such a manner that the light itself does not fall directly on the camera lens and it is advisable in this kind of work to use a lens hood. A slow backed plate or a slow film is the best negative material and as exposures of from 10 to 12 minutes with an aperture of F/8 will be required, the camera should be supported either on a tripod or a small table.

Even for such photographs as this it is not necessary to wait for suitable frost conditions, for "frost" effects can be made artificially by coating a sheet of glass with a hot solution of gelatine and then cooling the glass slowly. After a short time crystal formations closely resembling those of ice appear. The idea can be extended to various chemicals, solutions of which may be allowed to crystallise on glass plates, with extremely attractive results. Suitable substances are alum, sodium nitrate, potassium chlorate and ferrous sulphate. The glass plate must remain level and undisturbed while the solution is cooling out. When dry, the plate should be placed in front of a dark background such as a piece of black paper or cloth and illuminated by a lamp placed behind it and slightly to one side, care being taken to place the lamp so that it does not appear in the picture.

Readers who are busy looking for subjects suitable for use in making their own photographic Christmas cards should not overlook the possibilities provided by a Christmas tree festooned with fairy lights and candles gleaming in a darkened room! Such a subject as this is very easy to photograph with the simplest of apparatus, but to produce good results one of the slower films should be used. A slow unbacked orthochromatic plate is even better, for there will be a more decided halo effect round the candles and lights, and this will give the finished print a really Christmassy appearance. The exposure required will depend entirely on the power of the lights and candles and the distance of the camera from the tree, but with an aperture of F/8 from 30 to 40 sec. should be sufficient. With a fast film working under similar conditions an exposure of about 10 sec. should suffice.

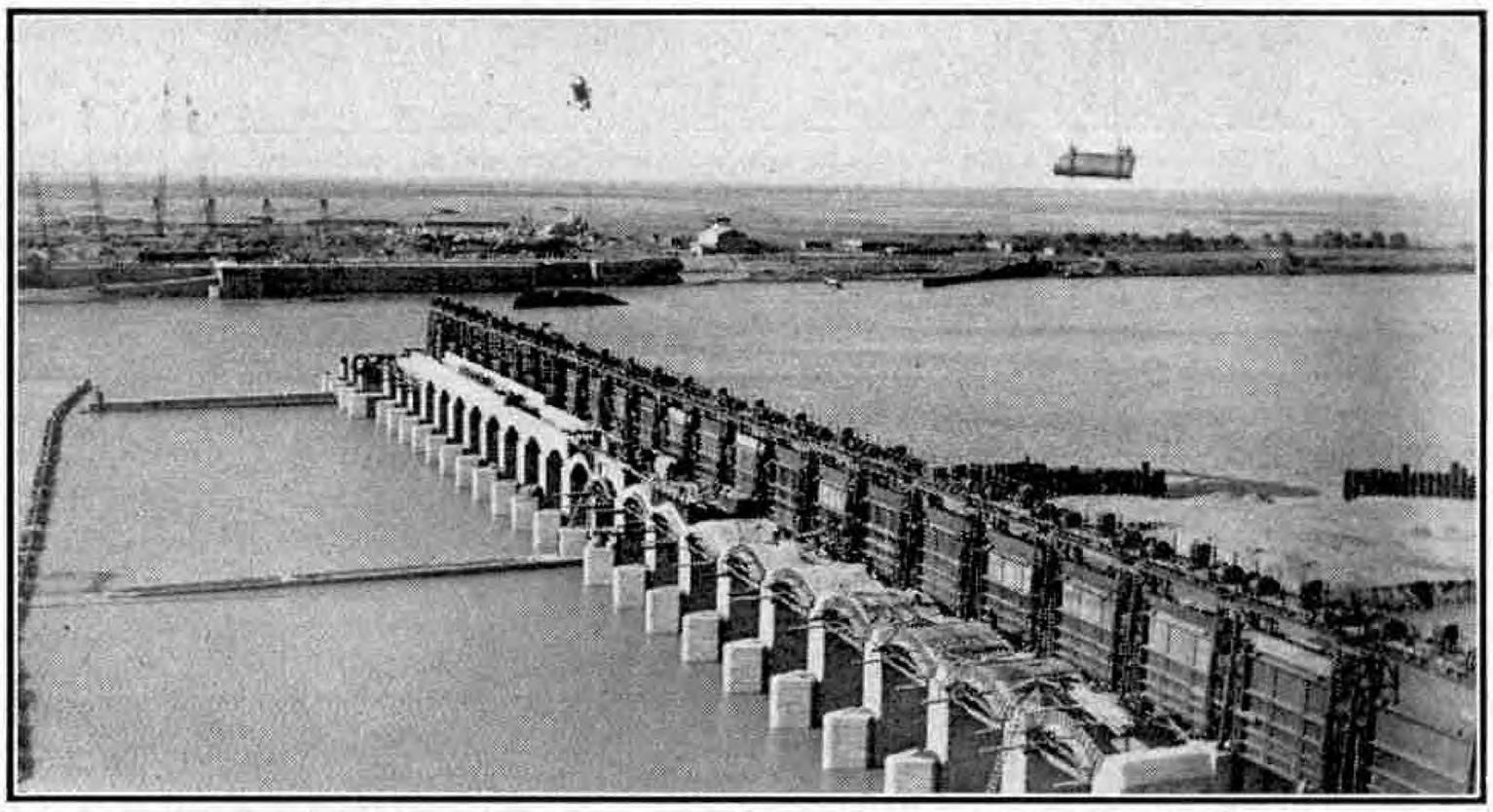
Table-top photography generally will give great fun at Christmas time, and will provide a profitable occupation if weather conditions enforce an indoor holiday. The article on this subject that appeared in last month's "*M.M.*" showed what a wide variety of table-top work can be carried out with even the simplest cameras, and I am sure readers will be interested in the further example of a "table-top" photograph reproduced in the lower illustration on this page. The massive rocks and rolling hills consist merely of a dirty crumpled rag sprinkled with sawdust and ashes from the kitchen grate!

Taming the River Tigris

Building a Giant Iraq Barrage

ALTHOUGH Iraq is a hot desert country, and therefore may be expected to be poor for agriculture, each year considerable crops are grown there, the chief being wheat, barley, Indian corn, beans, rice and dates. This high production is only made possible by extensive irrigation, for everything is grown in artificially-watered soil. Water for this purpose is drawn from the two main rivers of Iraq, the Euphrates and Tigris, which rise in the Kurdistan mountains to the north of the country, their sources being several hundred miles apart. With many twists and turns the two rivers flow southward and eventually converge at Al Qurna, some 40 miles north of Basra, through which town the combined rivers then flow on their way to the Persian Gulf.

The problem of irrigation has always been a very important one in Iraq, for the average annual rainfall is only five or six inches, although it may vary considerably from year to year. As a result of this erratic behaviour there are sometimes floods that inundate many miles of fertile land, isolate villages, and generally play havoc with the crops on which the country is dependent for its food. At other times the rivers are very low, and the waterless crops are then scorched and ruined by the intense heat of the sun. It will readily be seen that to devise a system of irrigation that would operate equally well under these two extreme conditions was indeed difficult.



The downstream side of the Kut Barrage in December 1937, seen from the left bank. The illustrations to this article are reproduced by courtesy of Messrs. Coode, Wilson, Mitchell and Vaughan-Lee, consulting engineers, of London.

Many centuries ago the Chaldeans perfected on the Euphrates and Tigris a wonderful system of barrages, canals and earthworks that artificially watered the land so efficiently that Mesopotamia, or the land "Between the Rivers," as it was then called, was widely known as "the granary of the world." Unfortunately the various erections were of a somewhat primitive nature; they lacked the solidity and strength of modern civil engineering works, and required a considerable amount of upkeep. As the years passed the earthworks were allowed to crumble and the canals to silt up, with the result that the system gradually fell into disuse and Mesopotamia again became a land of floods and arid desert.

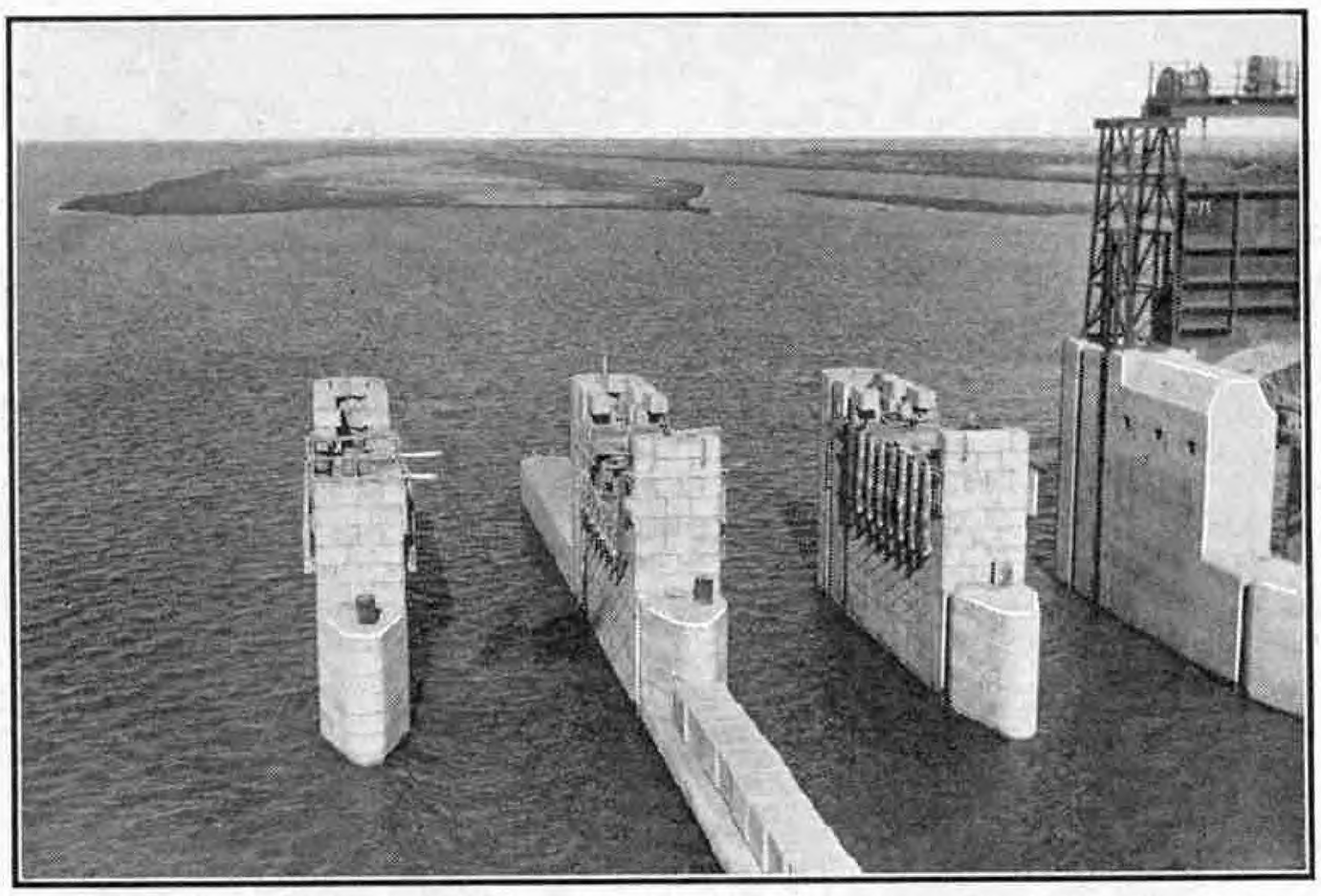
This state of affairs lasted for centuries, and it was not until recent years that steps were taken to provide controlled irrigation. A commission was set up to investigate the problem, and careful surveys were made of the land. The work was difficult and often dangerous, for isolated tribes in the desert wastes proved hostile to the surveying party. Eventually the work was completed, however, and a report on the investigation was issued. As a result it was decided to undertake the construction of an extensive scheme of barrages, canals and other irrigation works. This was to be done gradually, so that the great expense involved would not all have to be met at once.

The first work undertaken was the construction of a barrage across the Euphrates to allow a regular supply of water to be diverted into the Hilla Channel, which serves a large area of land and irrigates a district of immense agricultural value. The chosen spot was very near the site of an early dam erected by the Chaldeans to feed the Hilla branch. Tribal disturbances and general neglect resulted in the deterioration of the barrage and the silting up of the connecting canal, so that the district served by the Hilla Channel reverted to desert. The choice of almost the same site for the new barrage is evidence of the wisdom of the early engineers, in spite of their limited knowledge and equipment.

Work on the Hindiya Barrage, as the structure was named, was commenced in 1911 and carried on under the great disadvantages of intense heat, malaria, and absence of fuel. There were practically no transport facilities between the dam and the supply base, many miles away, but the task was carried out with the indomitable spirit of the engineer, and the great barrage, with a retaining wall one-sixth of a mile in length, was completed in the record time of two years and nine months.

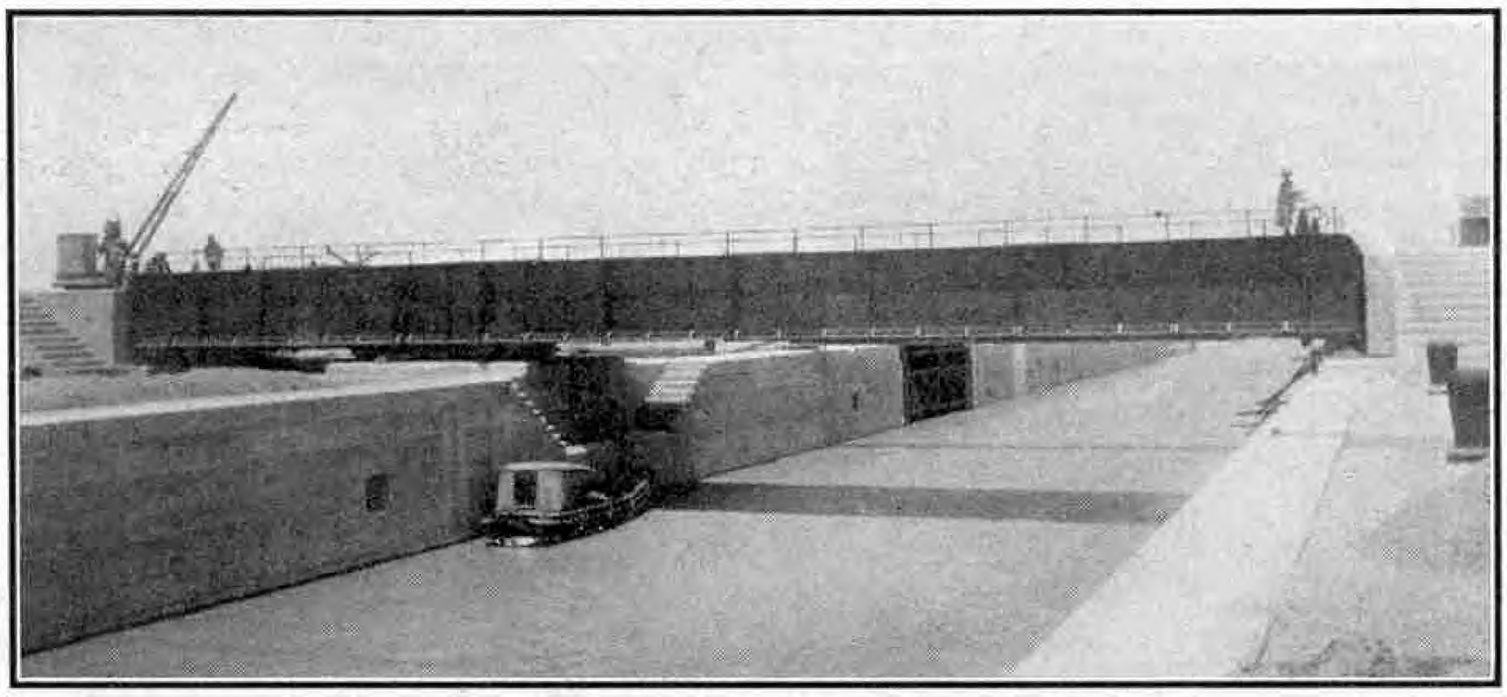
The barrage was built at the side of the river channel, and on its completion the water was diverted into a new channel that brought it to the barrage for distribution. The dam built to divert the stream into the new bed was constructed in a new yet old way, for although it had been employed by the Arabs for many years it was a novelty to the modern engineers. Reeds were brought from the higher reaches of the river, and tied up in huge rolls 60 ft. long and 9 ft. high. These were pushed into the water and weighted until they sank across the stream. Earth, brushwood and stones were then piled on top until a solid embankment 70 ft. in width was formed. This still efficiently performs its task of diverting the course of the stream.

Since Iraq became an independent state many small irrigation schemes have been carried out, and one or two large ones considered. The difficulty of finance has prevented the more ambitious schemes from being put into effect, and only recently has it been possible for the first of them to be carried out. This is the Kut Barrage, which was commenced in 1933 and is now nearing completion. When it is in use the agricultural possibilities of a valuable area of land in the neighbourhood of Kut will be greatly increased. This land is well to the east of the Euphrates. Formerly it was watered by the Shat-el-Gharraf, an ancient river containing water only during the flood season, which joins the Tigris at a point where the left bank of the river encircles the town of Kut. In the flood season the water there often rises more than 16 ft. above the lowest level, and on occasions has reached a height of over 24 ft.



Part of the centre training wall of the barrage, seen from the downstream side, showing the midstream arches under construction. The wall will have 56 openings when completed.

It will be realised that here, too, the uncertainty of the rainfall and of the quantity of flood water has limited the usefulness of the Shat-el-Gharraf for irrigation purposes. To provide a regulated flow of water into the cultivated area, the barrage is being constructed upstream of the town and the junction of the rivers. A channel has been excavated further up-stream on the right bank to carry water to the course of the Gharraf, whence it will be distributed. The work is in the hands of the Iraq Ministry of Economics and Communications, and is being carried out to the specifications and under the direction of Messrs. Coode, Wilson, Mitchell and Vaughan-Lee, consulting engineers of London. The contractors are Balfour Beatty and Co. Ltd., also of London.



The navigation lock and swing bridge at the western end of the barrage.

The barrage is about 1,625 ft. long, and will contain 56 openings, each almost 20 ft. wide, through which the water can pass, each opening being controlled by a single sluice gate. The piers that form these openings are built of moulded concrete blocks with a backing of massed concrete, and there is a roadway about 13 ft. wide along the top. The whole barrage is constructed on a foundation floor of concrete some 268 ft. wide, with an auxiliary block apron nearly 50 ft. in width. A navigation lock, about 53 ft. wide, has been constructed on the right bank of the river to allow boats to pass the barrage.

Steel pile cofferdams were constructed about 245 ft. from the line of the main barrage to facilitate work on the foundations and lower part of the wall and lock. The cofferdams were kept dry by pumps mounted on pontoons. Excavations for the foundations was first carried out by dredging, and the earth remaining was then dug out and removed by hand labour.

Experiments with models are proving of great value in the construction of the dam and the general maintenance of the river during the work. Scale models of the dam site and the various workings have been constructed, and tests have enabled the engineers to gain some idea of the reaction and resulting movements of the river. In this way it has been possible to keep a check on the scouring, silting and other disturbances to the river bed that otherwise would have gone on unnoticed until they caused trouble.

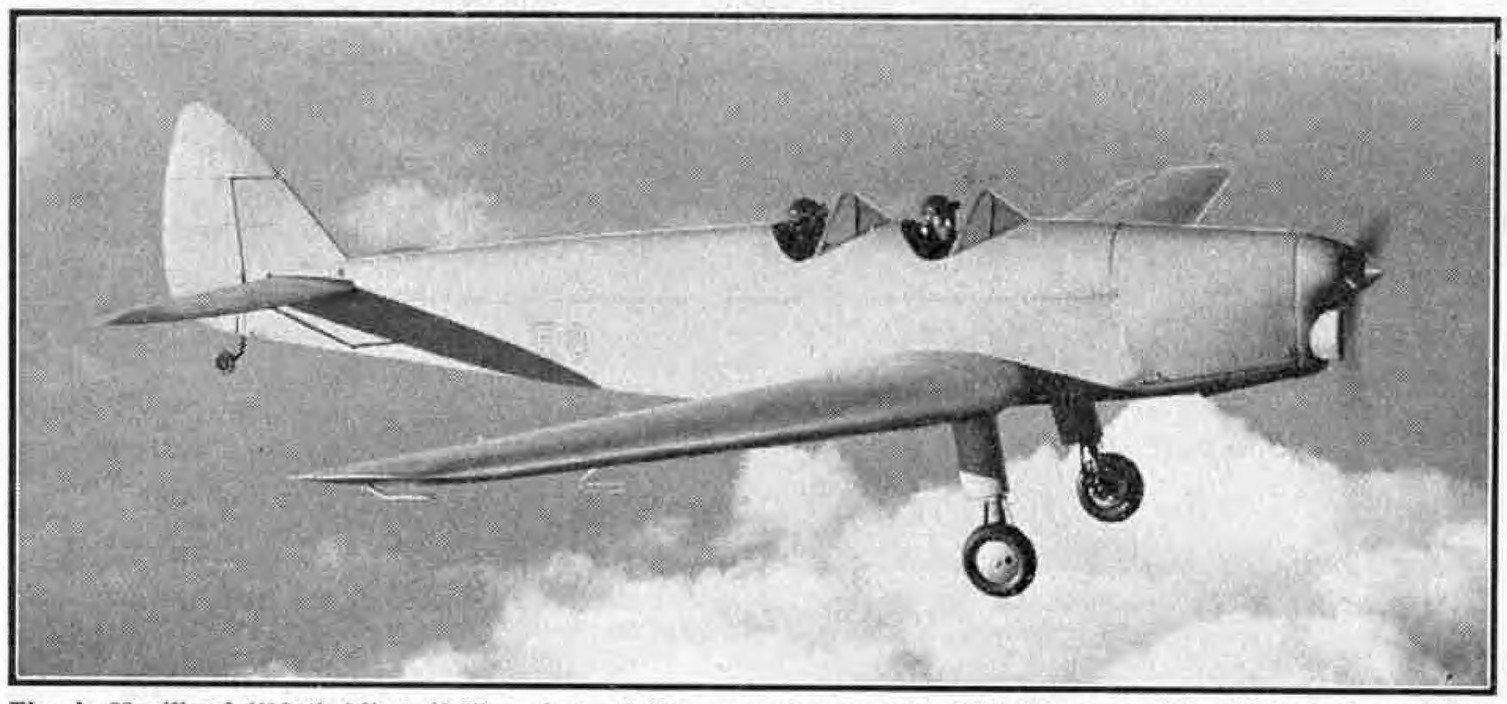
The canal that is being cut to lead water into the Gharraf River is nearly two miles long and is about 270 ft. wide at the bottom. A regulator is being provided at the head of the canal to control the amount of water running from the Tigris, and this has seven openings, each about 19 ft. 6 in. wide. There is also a navigation lock about 26 ft. in width.

It was stated some years ago by the leader of the commission that investigated conditions in Iraq that it would be possible to irrigate between three and six million acres of desert land in the Euphrates Valley alone. The Hindiya Barrage and the Kut Barrage, together with many other minor irrigation works, have made fertile many acres of what would naturally be barren land, and it is to be hoped that other plans for the reclaiming of the waste parts of Iraq will be put into effect in the next few years. That country recently was the scene of another interesting engineering feat. This was the construction of the gigantic pipe-line that now carries oil from Iraq across the desert to the shores of the Mediterranean. These and other developments are again making the country active and progressive, after a lapse of thousands of years.

New British Light Aircraft

Three Interesting Low Wing Monoplanes

ALTHOUGH the British aircraft industry is concerned chiefly with the production of military aircraft, increasing attention is now being given to the commercial side of the industry. There are many new types of civil aircraft now under construction in this country ranging from a twin-engined 18-seater air liner to neat, streamlined single-seaters. In size the three examples described in this article come between these extremes. They are the de Havilland "Moth Minor," the Miles "Monarch," and the Percival "Q" monoplanes.



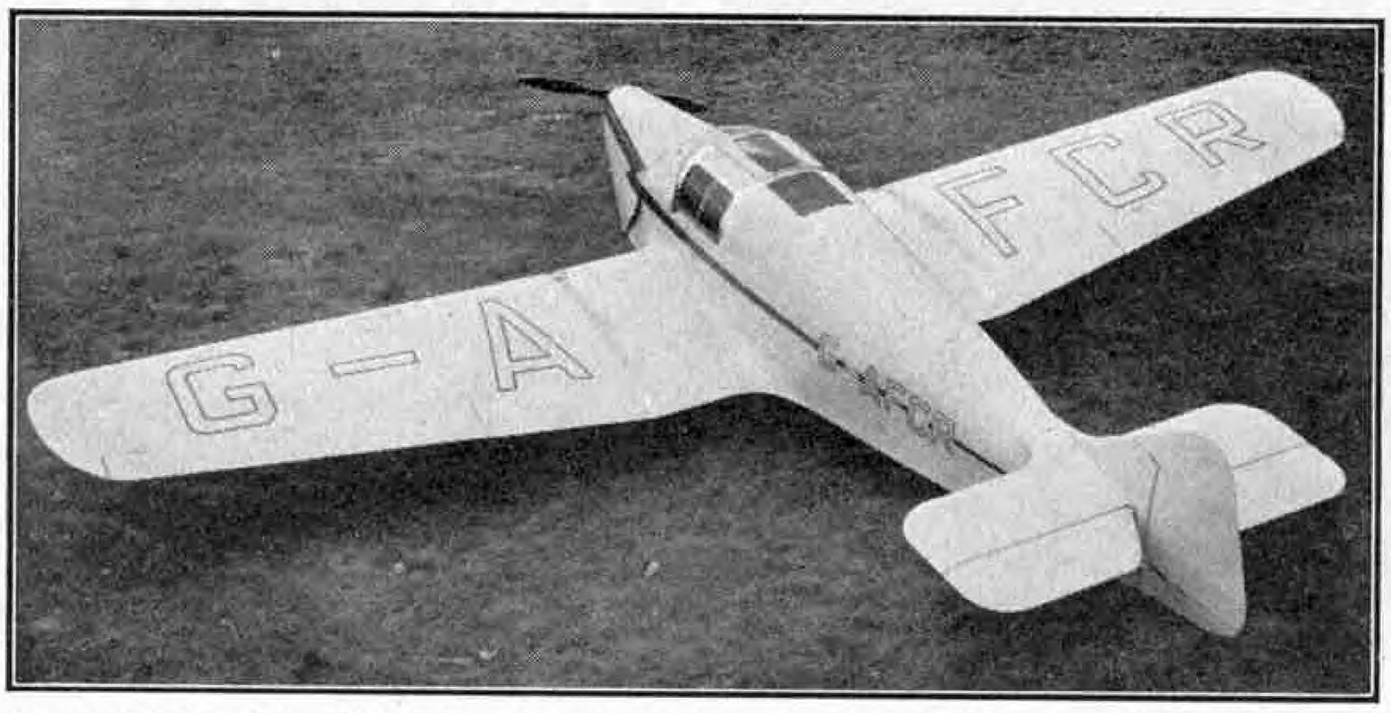
The de Havilland "Moth Minor." The wings of this monoplane can be folded back, enabling it to be housed in a space little larger than is required to garage a motor car. Photograph by courtesy of "Flight."

The D.H. "Moth Minor," shown in the upper illustration on this page, is a robust-looking two-seater equally suitable for the private owner who likes to be able to take a friend and a useful amount of luggage with him on his air journeys, or for the flying club requiring an exceptionally economical training aeroplane. The sudden introduction of the Air Ministry Civil Air Guard scheme has found such clubs seriously short of suitable economical aircraft in which to train the great number of applicants. The appearance of the "Moth Minor" is therefore very timely, and it is appropriate that the first order received for this new type came from the R.A.F. Flying Club.

The D.H. "Moth Minor" has behind it some 15 years of continual large-scale manufacture of "Moth" trainers, and only reached its final form after many tests and trials. For a year several experimental examples of the new aeroplane were test-flown almost daily, and the aeroplane and its engine were systematically evolved and refined to the stage when the tools necessary for large-scale production could be put in hand. These preparations are now well advanced, and quantity production of the aeroplane will begin early next year.

The "Moth Minor" is a low wing monoplane, the wings of which can be folded back to give a width of only 12 ft., so that it can be housed in a space little larger than would be required to garage a motor car. In its simplest form it has two open cockpits arranged in tandem. It can be fitted with dual control, and is equipped for all normal flying conditions. A good feature from the training point of view is that it is difficult to put the aircraft into a spin, and it "comes out" simply by centralising the controls. It is indeed so stable in the air that it may be flown "hands and feet off" for an indefinite period, and it can be flown solo from either cockpit without ballast. Generally the front one is used for solo flying.

The "Moth Minor" will shortly become available as a comfortable cabin tourer for private flying. In this form it will have a hinged coupé superstructure shaped to maintain the streamline of the fuselage, and high enough over the seats to provide ample headroom and view. Each type is fitted with a 90 h.p. D.H. "Gipsy Minor" engine. This has ample power for quick take-off and rapid climbing, and it is only developing 65 per cent. of its full power when the aeroplane is cruising at about 105 m.p.h. The cabin type machine will cruise at 115 m.p.h.

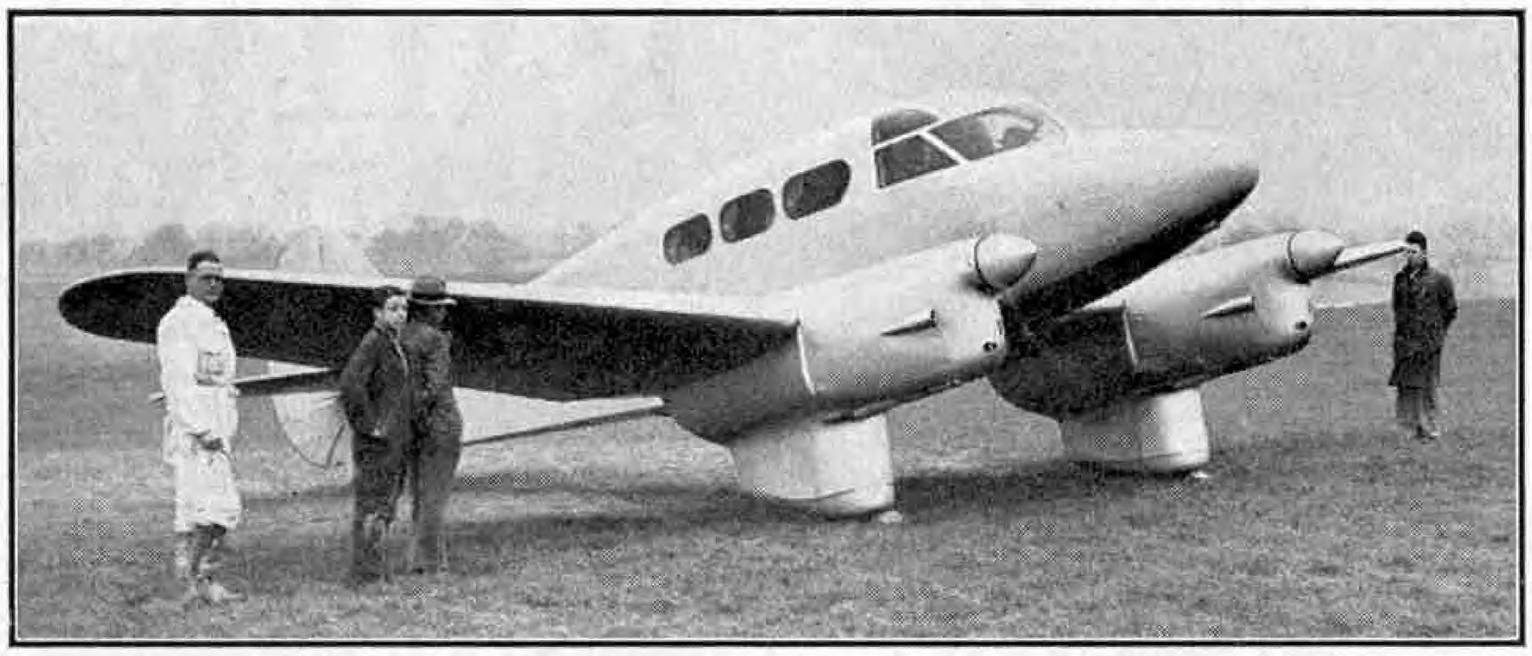


An unusual view of the Miles "Monarch," showing the large window in the cabin roof. This neat-looking aeroplane is normally a two-seater, but a third seat can be installed if required. Photograph by courtesy of Phillips and Powis Aircraft Ltd.

The other single-engined low wing monoplane illustrated here is the Miles "Monarch," the latest addition to the very successful series of light aeroplanes of this type produced by Phillips and Powis Aircraft Ltd., of Reading, several of which were described in the April 1938 "*M.M.*" It has been designed for the owner pilot, instructional flying, and general flying club use, and it is equally suitable for adapting as a light mail or freight carrier, a special charter machine, or for Army Co-operation work.

Normally the "Monarch" is a two-seater, but a third seat can be fitted behind the usual passenger's seat. The

cabin has a special streamlined one-piece windscreen of a type, pioneered by the company, in which there are no rivets or view-obstructing members, and which cannot be made obscure even in heavy rain. There are large windows on both sides of the cabin and in the roof, and the backward view also is unusually good. There is full dual control. The elevator trimming lever is placed centrally, and the brake lever is conveniently fitted by the throttle on the port side. The instruments are grouped in the centre of the dashboard and are well lighted, and there are map pockets on each side of the instrument panel.

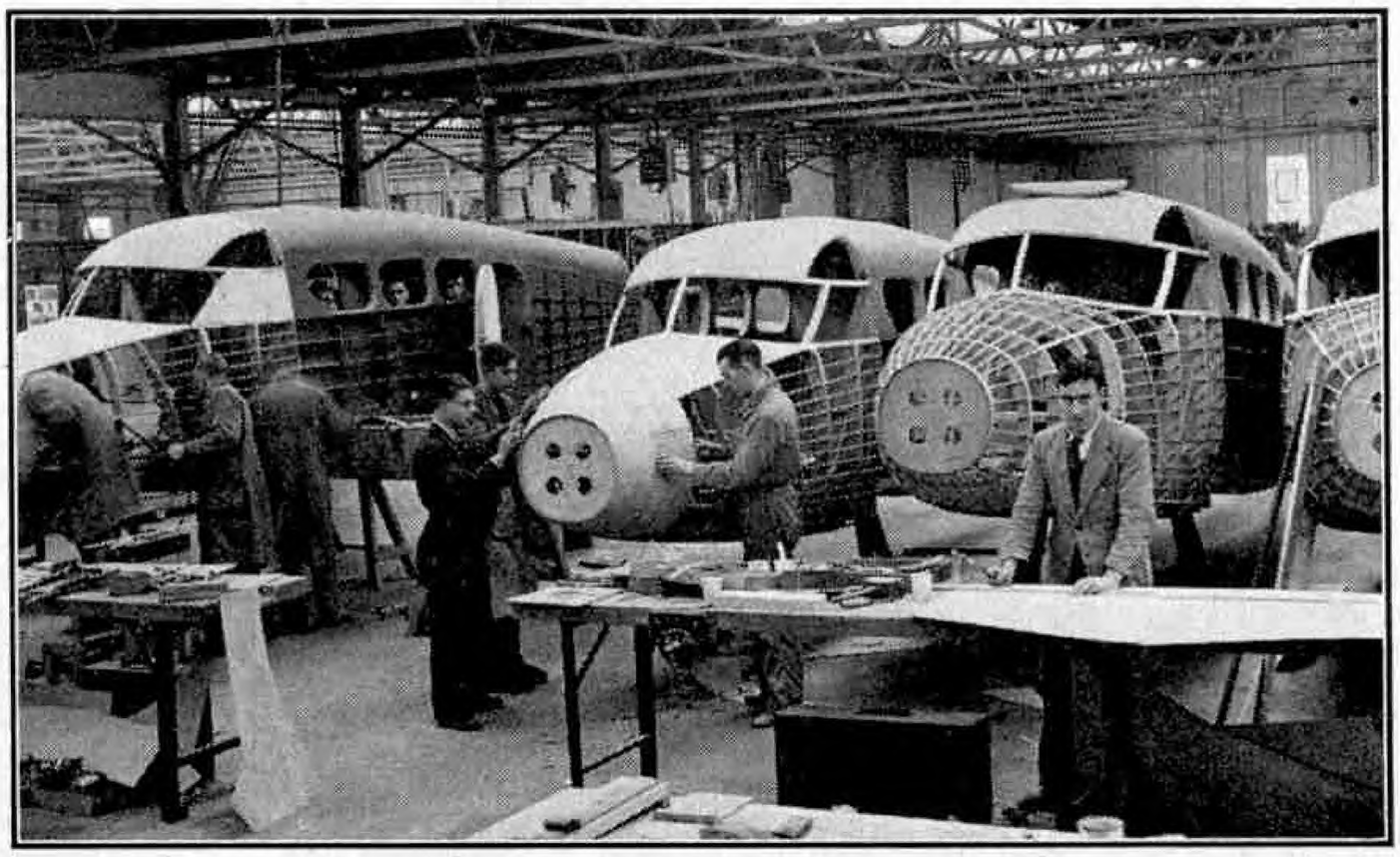


The Percival Q.6, a twin-engined monoplane. The deep engine nacelles enclose D.H. "Gipsy Six II" inverted, in-line engines. The photographs on this page are by courtesy of "The Aeroplane."

The monoplane is built entirely of wood, and is thoroughly protected both inside and outside against the effects of weather and extreme climatic conditions. All bolts securing metal fittings to the structure are provided with shrinkage washers to take up any play due to contraction of the woodwork in tropical conditions.

A special feature of the "Monarch" is the use of a new type of vacuum-operated flap, developed by the company and named the "Miles Glide Control." The flaps open in proportion to the amount the lever is moved, and this is interconnected with the throttle so that when the latter is opened the flaps close to the point of maximum lift, or nearly, which is about 15 degrees. The flap lever must be moved separately to close them entirely. The object of this arrangement is to obtain the maximum amount of lift with the minimum of drag, and to prevent the sudden and sometimes dangerous sink that occurs when the flaps are closed.

The Miles "Monarch" is fitted with a 130 h.p. air-cooled D.H. "Gipsy Moth" engine, which gives it a top speed of 145 m.p.h. and a cruising speed of 130 m.p.h. At cruising speed the engine is running well below its maximum power, and with normal maintenance and lubrication is good for 1,000 hrs. before a complete overhaul is necessary. The rate of climb is 850 ft. per min., and the absolute ceiling, or maximum height the aeroplane can attain, is 20,000 ft. The service ceiling is 17,400 ft. There are two 15-gall. aluminium fuel tanks, carried in felt-lined cradles in the wing centre section, and the petrol supply to the engine is remote controlled from the dashboard in the cockpit.

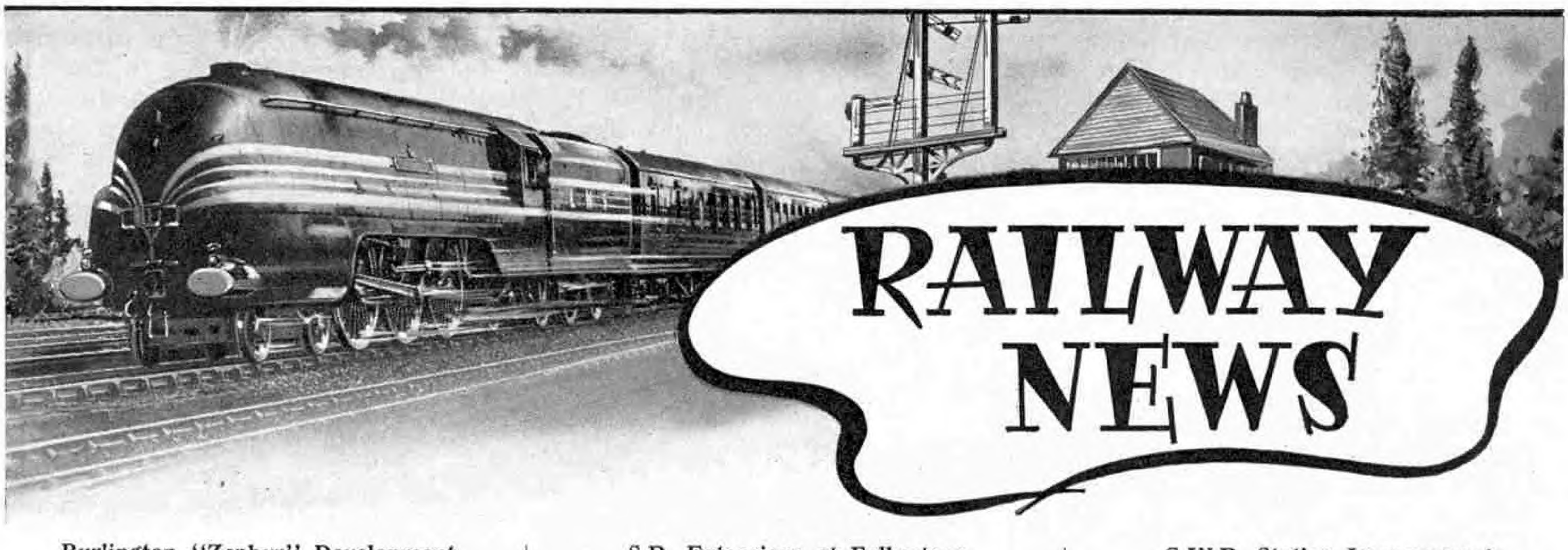


Fuselages of Percival "Q" monoplanes in various stages of construction. They are built of wood, except for metal conical-shaped nose-pieces.

The light aircraft produced by the Percival Aircraft Company are noted for their excellent flying qualities, comfortable cabins and elegant appearance. These merits are evident in the recently-introduced Q.4 and Q.6 monoplanes, which are almost identical, the main difference being that the Q.4 is fitted with two 140 h.p. D.H. "Gipsy Major II" engines and has a wing span of 44 ft., while the Q.6, illustrated on this page, has 205 h.p. D.H. "Gipsy Six II" engines and a wing span of 46 ft. 8 in. The performances of the two aeroplanes of course differ; the smaller one has a top speed of 170 m.p.h., cruising at 160 m.p.h. at 7,000 ft., and the maximum speed of the Q.6 is 195 m.p.h., with a cruising speed of 181 m.p.h. at 7,000 ft. In both cases the standard range is 700 miles, sufficient for a non-stop flight lasting about 4 hrs. The service ceilings of the two aeroplanes are 20,000 ft. and 21,000 ft. respectively.

The Percival "Q" low wing monoplanes are built of wood, except for metal conical nose-pieces to the fuselages. The wings are bolted to the ends of the wing centre section, which extends through the bottom of the fuselage. Ailerons are fitted to the outer portions of the trailing edges of the wings, and vacuum-operated split flaps extend from one aileron to the other, passing under the fuselage. Normally the "Q" aeroplanes have fixed undercarriages, with legs and wheels almost completely hidden by very deep fairings, but retractable undercarriages can be fitted. The navigating equipment is very complete, and includes a Sperry artificial horizon and gyro-compass and full blind-flying apparatus.

The Q.4 seats six persons, and the Q.6 six or seven, consisting of a crew of two and five passengers, or one pilot and six passengers. The moderate capacity of these aeroplanes makes them very suitable for the wealthy owner-pilot requiring an aeroplane large enough for family air tours, and for internal air line companies. Entrance to the cabin is by way of a large door in the port side, and the seats are arranged in pairs, with a wide gangway down the middle of the cabin. Each seat is beside a large window placed at a height that ensures a comfortable outlook.



RAILWAY NEWS

Burlington "Zephyr" Development

A ninth "Zephyr," embodying several innovations in operating appliances and passenger comforts, will shortly join the fleet of streamlined Diesel-electric trains of the Chicago, Burlington and Quincy Railroad. The eight already in service are two *"Denver Zephyrs"* operating between Chicago and Denver, two *"Twin Zephyrs"* between Chicago, St. Paul and Minneapolis, two *"Ozark State Zephyrs"* between St. Louis and Kansas City, the *"Pioneer Zephyr"* between Lincoln and Kansas City, and the *"Sam Houston Zephyr"* between Houston and Fort Worth in Texas.

The new train is a four-car unit and when delivered will be assigned to the *"Ozark State Zephyr"* service between St. Louis and Kansas City. The original *"Ozark State Zephyr"* train will be sent to Texas to run in pair with the *"Sam Houston Zephyr."*

Each car of the new train will be lighted, heated and air-conditioned by a self-contained Diesel-electric unit located in a sound-proof chamber underneath the car. Another striking innovation will be found in the braking system, which entirely eliminates the traditional brake shoe operating against the wheel tread. Instead, the braking power is applied to discs mounted between the wheels. These discs allow rapid loss by radiation of the heat generated by braking friction. Extensive tests have proved this braking system to be remarkably effective, and engineers estimate that it will be possible to bring the new "Zephyr" to a comfortable stop from 100 m.p.h. in approximately 2,000 ft.

A new type of indirect lighting will be used for the first time on the new "Zephyr." It is known as fluorescent lighting, and gives about double the candlepower of ordinary lighting for the same amount of current. The illumination approximates more closely to daylight than anything hitherto developed.

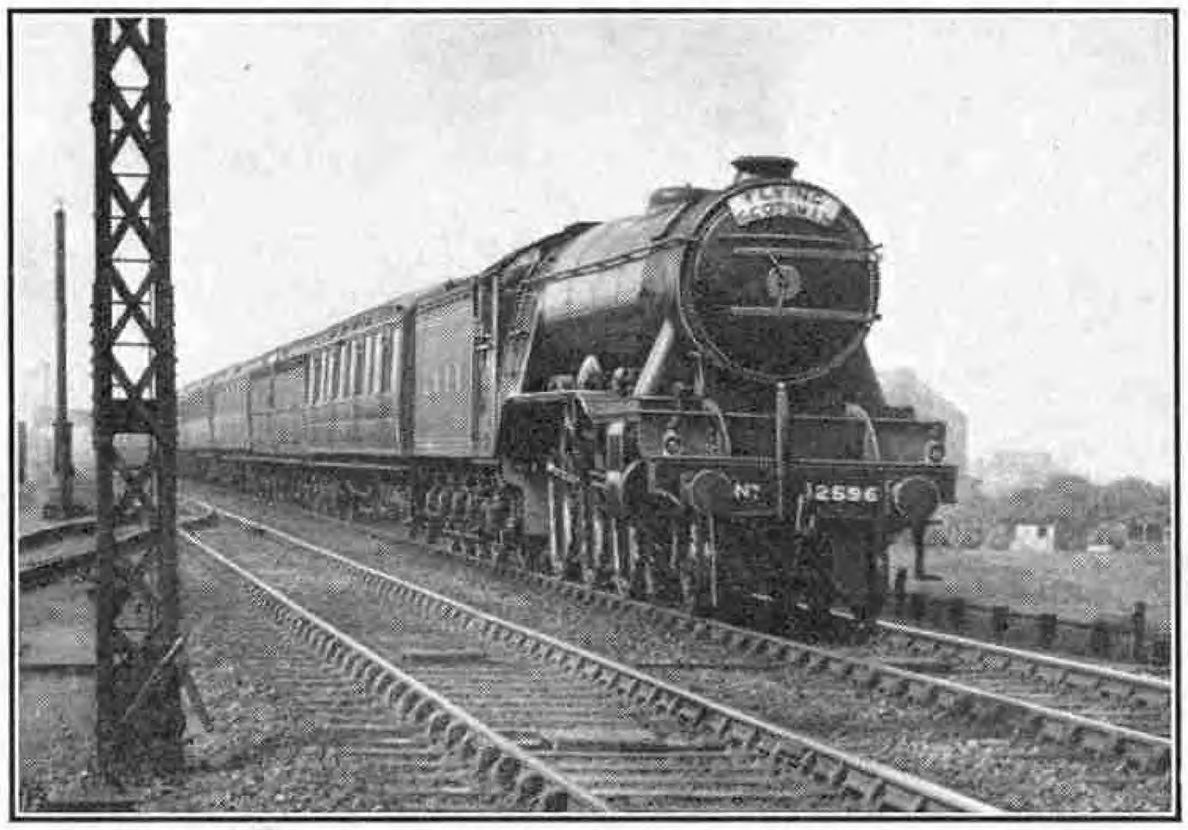
The car trucks will be equipped with roll stabilizers to minimise swaying tendencies on curves at high speeds. Tight-lock couplers of an advanced type will be employed to control slack between cars and eliminate shock and noise. Like all other "Zephyrs," the new trains will be constructed of stainless steel.

S.R. Extensions at Folkestone

Folkestone Harbour Station is to be made more convenient. Protection will be provided for passengers at No. 2 Berth, and the only exposed part of the journey from the ship to the Customs Examination Hall will be the passage down the gangways, where, owing to the open sea conditions, covered gangways have not been found practicable. A full length boat train occupies the whole of No. 2 Platform and part of No. 3, and at present it is necessary for passengers to cross the exposed portion between the two platforms. Additional roofing will be erected over the open space, together with back screens where practicable.

As it is frequently necessary during the summer months for boat trains to run in three sections, and the existing accommodation only allows two trains to be dealt with at one time, No. 1 Platform is to be lengthened from 308 ft. to 700 ft. to take a full-length boat train. The proposal will necessitate the provision of a covered footbridge between Nos. 1 and 3 Platforms, and, in accordance with the general idea of the whole scheme of protection for passengers, the whole of the No. 1 Platform extension and the portion of the existing platform that is uncovered will be roofed.

The station buildings will be attractively modernised on the lines of similar schemes already carried out at many Southern Railway stations, with improved lighting, and modern furniture.



The up "Flying Scotsman" approaching Newark. The engine is a "Super-Pacific" of Class A3, No. 2596 "Manna." Photograph by J. P. Wilson, Nottingham.

G.W.R. Station Improvements

A further big scheme of alterations in South Wales is to be carried out by the G.W.R. at Whitland, which is an important main line junction for the Cardigan and the Tenby and Pembroke Dock branch lines, and also for the lines to Fishguard and Milford Haven. The two island platforms are to be lengthened by 120 ft. and 160 ft. respectively, and the down platform is to be widened by 12 ft. on the Tenby branch side. A new waiting room will be provided. On the up side there will be new station buildings, including booking office and hall, parcels office, waiting room and station-master's office, and the approach to the station from the road will be easier of access.

The existing locomotive depot at Whitland will be demolished, and a new one erected on a more convenient site half a mile west of the station. This new depot will provide for the handling of the 16 locomotives stationed at the shed and will be equipped to deal with running repairs. There will also be a 65-ft. turntable to accommodate the larger engines working to and from the area, and improved coaling facilities.

The approach at Worcester, Foregate Street, Station is to be converted into a bright, colourful arcade type of entrance, roofed in the latest style with glass blocks and paved in cream coloured tiles. Above the entrance to the arcade will be a brightly illuminated fascia carrying the name of the station. The booking office at present situated on the concourse will be completely demolished so as to make for unrestricted movement, and a new office with modern grills will be built on one side of the arcade.

Glasgow Exhibition Record

The scale-built model trains representing *"The Coronation Scot,"* the *"Coronation,"* the *"Cornish Riviera"* and the *"Brighton Belle"* expresses, running over the 640-ft. miniature track in the British Railways' Pavilion at the Empire Exhibition, covered 3,120 miles during the six months the Exhibition was open.

Threading their way through scenic dioramas arranged in the form of a tour of Great Britain, the models have made 25,000 circuits of this Britain in miniature.

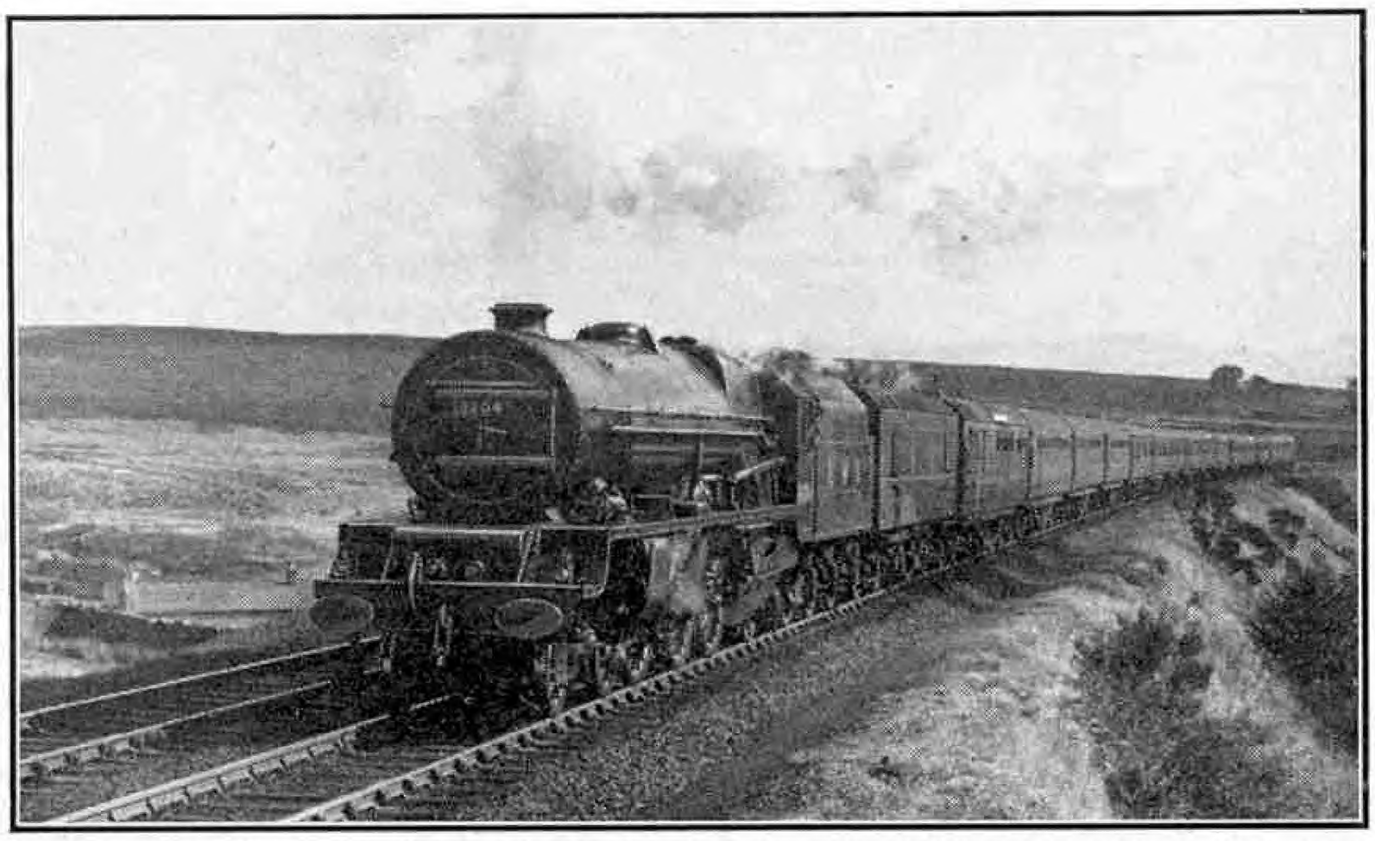
Speeding by *"The Royal Scot"*

The L.M.S. *"Royal Scot,"* northbound, with its start-to-stop schedules of 61.9 m.p.h. from Euston to Rugby and 60.4 m.p.h. thence to Crewe, is now called upon to perform more than 150 miles of sustained high-speed running over the southern section of the West Coast main line. The latest Stanier 4–6–2s have no difficulty in maintaining these timings with the rostered maximum load of 420 tons, however, even under unfavourable weather conditions. This is demonstrated by a journey made in the early days of the winter service. Streamlined engine No. 6228 *"Duchess of Rutland,"* hauling a 13-coach train of 405 tons tare and 425 tons gross, had to contend not only with a strong north-west wind and rain, but also with delays amounting in the aggregate to about 8 minutes. Yet Crewe was reached only a minute late, and was left on time.

A very severe slowing for permanent way operations at Bushey caused the train to take 23½ min. to pass Watford, 17½ miles, but *"Duchess of Rutland"* made a magnificent recovery from walking pace at Bushey to no less than 65 m.p.h. at Tring, the latter figure being steadily maintained up the rising gradient of 1 in 335. The 38 miles from Tring to Weedon were covered at an average of just under 75 m.p.h., with a remarkable minimum speed of 67 at Roade, and no higher maximum than 80 at Cheddington. Hillmorton, 80¼ miles from Euston, was passed in 77¼ min., and the 80-minute booking to Rugby would have been kept but for a concluding signal check; as it was, the 82½ miles to Rugby stop were covered in 81 min. actual, and about 77 min. net.

Sustained fast running across the Trent Valley, with a maximum of 83 m.p.h. near Nuneaton, took the train through Rugeley, 41¾ miles in 38½ min., but a virtual stop for signals, costing about 4 min., ensued at Colwich. Again a splendid recovery was made, and, after slacking from 63 to 52 m.p.h. over Stafford curve, a spirited effort was made to reach Crewe on time. With the regulator fully opened, but no greater cut-off than 18 per cent., *"Duchess of Rutland"* steadily accelerated up the long gradual rise from Stafford to Whitmore, covering the 14 miles in 12 min. 52 sec. instead of the 15 min. allowed, and breasting the 1 in 398 at Whitmore at 70 m.p.h. Betley Road, 70.7 miles from Rugby, was passed in 69¾ min. from the start, at 80 m.p.h.; but a further signal check outside Crewe caused the overall time to be 76½ min. instead of the 75 allowed for the 75.5 miles. Allowing for delays, however, the net time was only 72 min., a convincing demonstration of the great power and efficient management of the engine. Driver F. C. Bishop of the Camden *"Coronation Scot"* link was in charge on the footplate.

The run was recorded by Mr. D. S. Barrie.



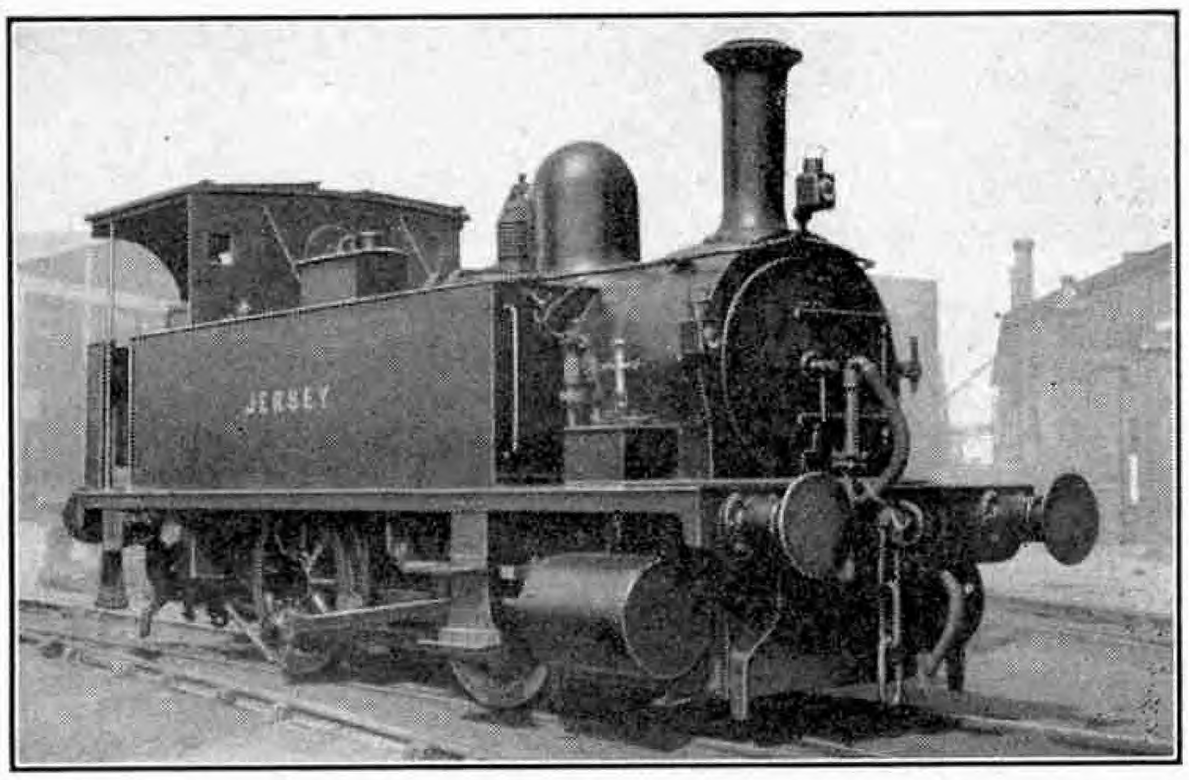
The down "Royal Scot" ascending Shap incline. The train is made up to 16 vehicles and is hauled by 4-6-2 No. 6204 "Princess Louise." Photograph by the Rev. E. Treacy, Liverpool.

G.W.R. Locomotive Notes

"Castle" class 4–6–0s Nos. 5075–7, *"Devizes Castle," "Drysllwyn Castle"* and *"Eastnor Castle,"* were turned out from Swindon recently. New 0–6–0Ts Nos. 3780-8 were also placed in traffic at the same time.

L.M.S. to Increase Fleet of Caravans

Owing to the popularity of holiday caravans the L.M.S. have decided to increase their fleet of 142 situated at various seaside and inland sites in England and Wales by an additional 40 vehicles, which are to be brought into commission in readiness for the 1939 holiday season.



S.R. No. 81 "Jersey," one of the small 0-4-0 tank locomotives specially built for service at Southampton Docks. Photograph by J. R. W. Kirkby.

During last season close on 2,000 weekly tenancies were booked in England; over 500 in Scotland, and 207 in Northern Ireland.

Notes from America

American railways operate 56 per cent. of the passenger trains classified as the fastest scheduled runs in the world.

In 1930 the total daily mileage run by American passenger trains at a mile a minute or more was 1,100, while to-day there are more than 40,000 with claims to this title.

Strengthening Unstone Viaduct

Seven hundred tons of concrete and 35 tons of steel bars will be used by L.M.S. engineers in strengthening Unstone Viaduct, between Chesterfield and Sheffield, in order to bring it up to the strength required to carry the weight of modern locomotives travelling at high speeds. The viaduct was originally built in 1868-70, and consists of seven spans with a total length of nearly 300 ft., carrying the main line at a height of 60 ft. above the valley of the River Drone.

The work will take about six months to complete, and is being undertaken mainly at week-ends. The old brickwork in the arches will be repaired, and a raft of reinforced concrete placed on the top of each arch; six week-ends will be required to complete two arches. Eight hundred tons of ballast and filling have to be removed from over the arches, and 1,200 tons of stone cut away.

Temporary crossover lines have been laid in at both ends of the viaduct in order to allow work to proceed on one side while trains pass over the other, and single-line working will be in force at week-ends until next March.

Bricks and Tiles by Rail

The railways are the biggest carriers of bricks in the Kingdom, last year conveying 4,732,000 tons. The main flow of brick traffic is to the larger centres of population where the building of shops, factories, and housing estates is constantly in progress. Where the volume of traffic is sufficient, special trains are arranged, and regular services of through "brick trains" are run almost daily between the larger brickfields and some of the more important centres. For example, nine booked services are operated each day from the Northamptonshire brickfields. Scottish fireclay bricks have a world-wide market, and much of the production is conveyed to Scottish ports for shipment abroad. A substantial proportion of the output, however, is used in the steelworks on the North East Coast of England, the West Midlands and South Wales.

Bricks and tiles are usually carried in open, medium and high-sided wagons, or in open type containers. Special brick wagons with capacities of 20 and 50 tons, fitted with automatic brakes, also are available.

Jubilee of *"G.W.R. Magazine"*

We congratulate the *"G.W.R. Magazine"* on having attained its 50th birthday. For many years it has been a pleasure to note the steady increase in the attractiveness of this paper and in the interest of its articles. It has succeeded in the difficult task of appealing both to the G.W.R. staff and to the general public.

HOW THINGS ARE MADE:

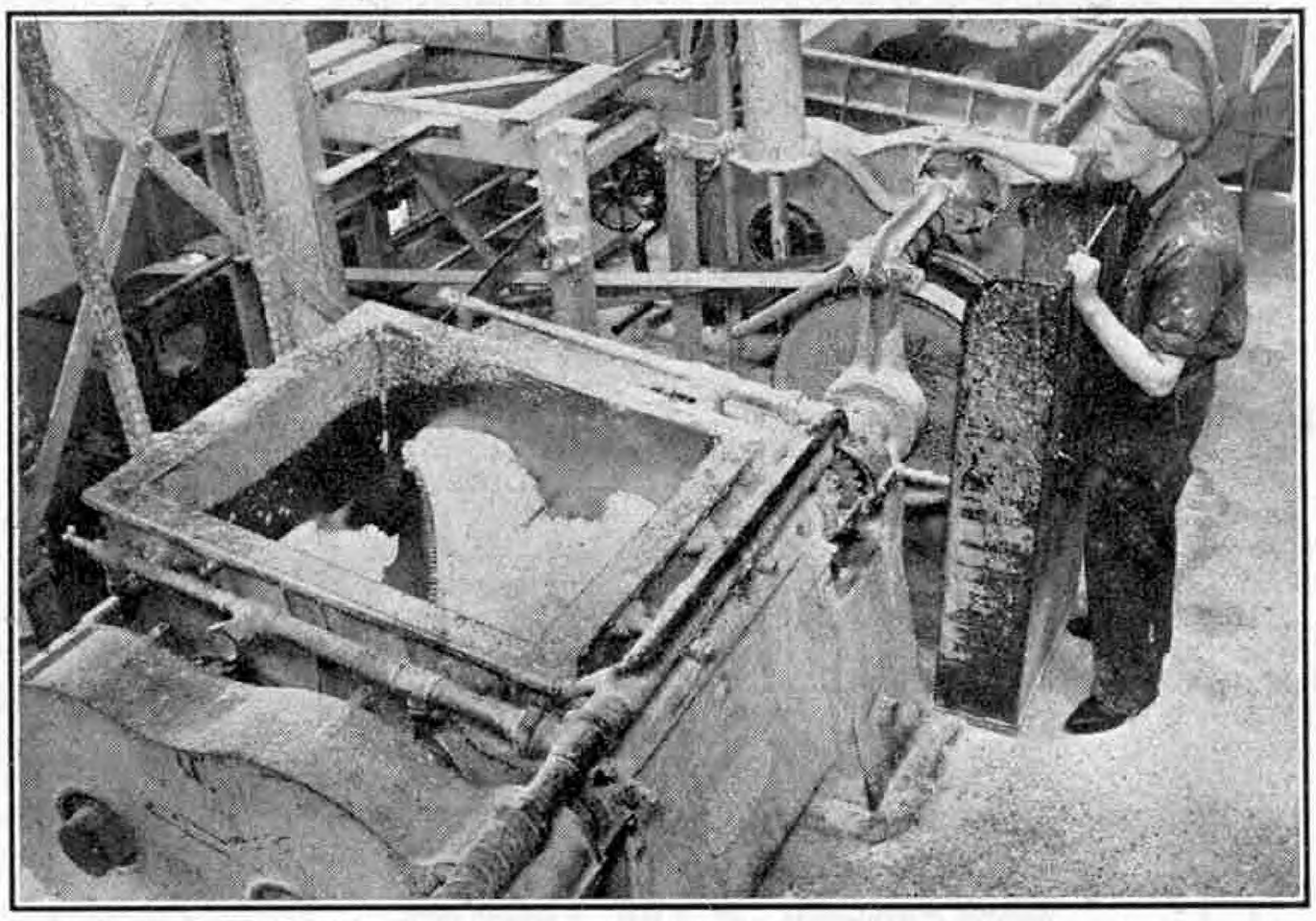
Plastic Mouldings

By O. S. Nock, B.Sc., A.M.I.Mech.E.

ONE cannot visit any exhibition nowadays in which engineering plays a part without noticing the extensive and varied use made of plastic mouldings. There are the familiar black and chocolate-coloured grades used as insulators in electrical fittings; there is much the same material, but in rich or delicate colours, used as a base or housing for appliances that do not require the strength of a metal; and lastly there is a different form altogether in which the plastic is marketed in thin sheets, used for panelling effects in ultra-modern interior decoration schemes. The beauty of these products compels admiration, yet in response to the natural question, "How are they made?" few of their admirers would be able to go beyond the remark: "Oh, they are moulded."

Before proceeding to the actual methods of manufacture it is necessary to gain some idea of their many ingredients. The development of the plastics industry is one of the romances of engineering. The whole business of plastic moulding is based on substances that not many years ago were a positive nuisance to the industrial chemist. The basic ingredient of Bakelite is a gummy indefinite kind of stuff that was the despair of research workers; it would neither melt properly, nor yet crystallise. It is a sort of artificial resin, and exists in countless varieties.

One of the most widely used has the formidable name of phenol-formaldehyde; it is a particular combination of ordinary carbolic acid with formalin, and both these constituents are products of the carbonisation of coal. Phenol, otherwise carbolic acid, is extracted from coal-tar, and formalin is a valuable by-product of the manufacture of coke. But phenol-formaldehyde itself would not be of any use for moulding purposes. To it there is added a curious assortment of substances that make the basic gummy stuff into a commercial product, in just the same way as concrete is made up of a number of different constituents. The plastic needs what is called a filler, such as wood meal, to give a certain amount of strength; and further toughening is provided by the insertion of tiny fibre strands, this being somewhat akin to the re-inforcing of concrete by metal wires. Lubricant in the form of fats, or wax, is added to make the substance flow easily when moulding is in process, and then of course there is colouring matter.



Baker Perkins mixer used in the production of moulding powders. The knife can be seen in action. Photograph by courtesy of Imperial Chemical Industries Ltd.

The mixing of these various ingredients is every bit as important as the actual moulding, and several firms specialise entirely in this section of the industry. The processes vary in detail according to the type of finished article required, but a typical treatment as used in the preparation of Bakelite moulding powder serves to show both the speed and the specialised nature of the job. The basic artificial gum, or resinoid as it is called, is taken in the solidified form and ground into a fine powder. It is then ready to be introduced to the mixing machine. The principal members of a mixing machine are two polished steel rollers, working together like an ordinary household mangle, and capable of being set at varying distances apart. A hollow passage runs down the middle of each roller, and through this passage steam can be blown.

The mixing process begins with the feeding of resinoid on to the rollers. These have already been heated by the steam passing through their cores, and after a short time the resinoid melts and sticks to the rollers. As soon as the specified amount has been put into the machine, and both rollers are revolving completely covered with an exceedingly sticky mess, the other ingredients are added. A certain amount of mixing takes place as the stuff passes through the mangle, but this would not be enough, and at this stage powerful knife blades are brought into action that strip all the mixture from the rollers and cause it to fall into a tray beneath. It is then fed back on to the rollers, passed through the mangle several times, and once again stripped off by the knives. This process is repeated several times, and then the rollers are gradually cooled down; the mixture begins to solidify, and it is peeled off as a continuous blanket of mouldable material. This blanket is not a convenient form for marketing, and it is therefore broken up and ground into a fine powder. The business of mixing has been reduced to a fine art, and the process I have just described is often accomplished in no more than five minutes.

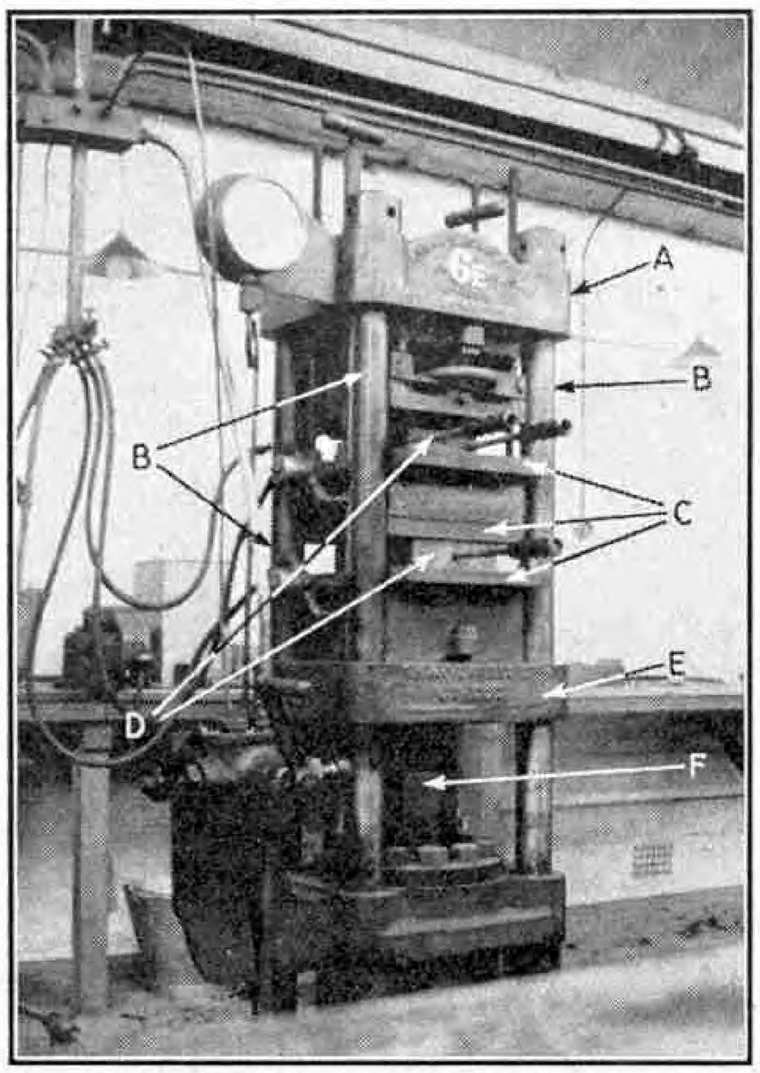
We come now to the principal operation, the actual moulding, but in order that readers may fully appreciate the reasons why plastic mouldings have become so very popular in the last 15 years I must explain the rather extraordinary properties of the material itself. The resinoid, which is the basis of all plastic mouldings, when heated to a moderate temperature, say not more than 80 deg. C., is plastic and workable; if however it is heated beyond that critical temperature it sets permanently hard, and no amount of further heating will cause it to melt. The mixing process is of course done at a moderate temperature. The finished article is shaped in a pair of dies, which are heated to such a temperature as to cause the powder first to become plastic and flow to the desired shape, and then to harden. The dies themselves are in form not unlike those used for drop stamping in the smithy of an ordinary engineering works, but the actual shaping is done by forcing the two halves of the die together in a hydraulic press.

The making of dies for plastic moulding is a highly skilled business. The impression of the article has to be carved out on the face of a solid block of extremely hard steel. Now although a good deal of this cutting out can be done with machines—some parts are done on a lathe, others on a shaping machine, and so on—all the finishing has to be done by hand. One scarcely realises, when examining a plastic moulded article, the degree of care that is necessary in the final finishing off; the smallest scratch, let alone the marks of a machine tool, would be faithfully reproduced on the article, and all surfaces of the die, and especially sharp corners, are given a "mirror finish" to ensure that no extraneous marks appear on the completed job. This entails patient and experienced hand-scraping, and finally a considerable amount of buffing and polishing, for which process a grinding wheel composed entirely of silken discs is used. For making a Bakelite article say six inches square the complete "tool," which comprises a pair of dies and their accessories, may cost anything up to £150. The finished article will probably be sold for sixpence.

For small articles, of which a very large number may be required, six or more impressions are cut in the same die, so that mouldings can be made six at a time. Speed of production is usually of paramount importance where plastic mouldings are concerned; many dies are fitted with ejecting devices that not only deliver the finished job as and where it is required, as for example on a travelling belt conveyor, but also eliminate any risk of the operator

touching the very hot metal of the die.

The upper illustration on this page shows one of the simplest forms of moulding press. The head A is fixed by vertical pillars B, which act also as guides for the table E. The latter is supported on the head of a hydraulic ram the piston of which is indicated by the letter F. The dies in which moulding takes place are shown at D; the handles for easy insertion and withdrawal by the operator are clearly seen. On each side of each die are plates, C, by which the heating of the dies is carried out. These platens, as they are called, are usually made with a number of passages through which steam is passed, though in certain types of moulding press the heating is done by gas jets or electricity.



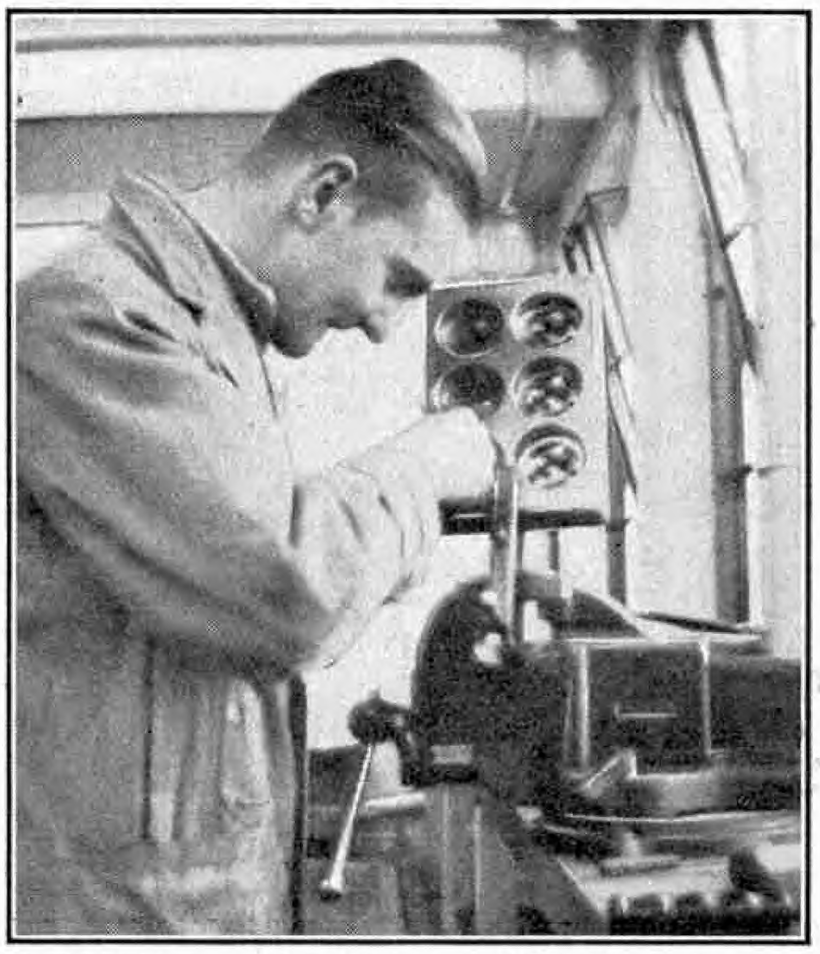
One of the simplest forms of hydraulic press used in making plastic mouldings.

In factories where very large numbers of one moulded article are turned out automatic presses are used, in which moulding powder is fed into the dies, the dies are set and placed in the press, moulding is done, and the finished job is placed on a travelling conveyor. The operations are however followed through more easily on a hand-charged press, where there is more time to appreciate the significance of each stage in the moulding.

First of all the mould requires loading with the right quantity of moulding powder. To save portioning it out with a ladle for each small moulding, a specified amount that has been found by experience to be correct is compressed into a tablet, and the operator is supplied with a number of these tablets. All that is necessary is to place one of these tablets in each impression, and then fit on the upper half of the mould. The two halves will not quite meet. Then the assembly is placed between the heated platens and pressure is applied. As the powder melts, some of it comes squeezing out between the two halves of the mould, and the onlooker will immediately note that in the plastic state the material is quite a different shade of colour from that of the powder. The tablets may, for example, be the bright bluish green of oxidised copper or verdigris; the stuff that comes squeezing out during moulding is a rich yellow-green, and this is also the colour of the finished product.

After full pressure has been applied, that is something of the order of 3,000 lb. per sq. in., and the job is moulded to its correct shape, the mould must not immediately be removed from the press. A period of "curing" is necessary, during which the finished product is heated to a sufficiently high temperature to ensure permanence of shape. A press of the kind illustrated lends itself well to rapid output, for while the operator is removing the finished articles that have been moulded between the upper pair of platens, and re-charging the die ready for the next batch, another job can be left curing between the lower pair of platens. The temperatures of course require careful arranging so that the curing time fits in with the speed at which a man can unload and re-charge a pair of dies.

So far I have been dealing almost entirely with mouldings of the Bakelite, or phenolic class. These are widely used for insulating purposes in electrical equipment. In this class of work mouldings have the big advantage that metal portions, such as contact pieces in switchgear, can be moulded in. A series of terminals such as are used in power signalling on railways can be moulded into one block, and each one be adequately insulated from its neighbour. The technique of moulding with brass or phosphor-bronze inserts is, like most other branches of the plastic industry, based on much practical experience. A portion of the insert is, in the finished article, completely bedded in the Bakelite; this buried portion has to be carefully designed so that the plastic stuff can flow easily into all the undercut portions and so give a sound enough grip. The inserts are usually pressings or products of an automatic lathe. Appropriate recesses are made in the dies to accommodate them, and these recesses have to be so arranged that there is no possibility of the insert shifting when the full pressure required for moulding is applied.


Hand-finishing moulds. We are indebted to Charlesworth Mouldings Ltd., Birmingham, for the illustrations on this page.

The use of inserts has probably reached its most intricate application in the manufacture of automatic telephone parts. In the thousand-and-one different units in a modern exchange numerous tiny contact fingers are moulded into a single insulating member; indeed, if this method of construction were not available many of the instruments would be very much less compact. Mention of automatic telephone work also recalls the use of Bakelite material in the form of thin sheets. Strictly speaking this is not a moulded product, but the composition is so similar, and its applications are becoming so extensive, that a passing mention will be of interest. The make-up is much the same as of moulded material, but the filler is usually canvas or rag, instead of wood. This gives the additional strength required in a product marketed in thin sheets. For electrical purposes the sheet Bakelite is used in its natural yellow colour, or in black; but many varieties of rich colour and pastel shades are now available for mural panelling and other architectural work.

For decorative rather than purely utilitarian purposes, mouldings in which the basic resinoid is urea are in great favour. Urea is a colourless crystalline substance; it is a synthetic combination of ammonia and carbon dioxide, and is used extensively as a fertilizer. Combined with formalin it possesses plastic qualities closely similar to phenol, and owing to its colourless nature very beautiful transparent effects can be obtained in the finished mouldings. The method of moulding is practically the same as for the Bakelite class. By the addition of suitable dyes to the moulding powder almost any colour can be produced. The lovely mottled finishes that one sees nowadays are obtained by adding powdered colouring matter in certain definite proportions after all the other ingredients of the moulding powder have been ground up together.

There are other varieties of mouldings that come within the general classification of "plastics." Casein products—coloured buttons, and such like—of which the basic ingredients are milk and water, are pressed into shape at comparatively low temperatures. There is no sticky condition, as always occurs with Bakelite moulding. On the other hand articles of which celluloid is a principal constituent are moulded from a condition that is nearer liquid than plastic. Moulding powder which becomes fluid in the process, is forced into a die by means of a ram working from a supply hopper. The dies used are similar to those used for moulding Bakelite, except that an entry for the material has to be provided, in exactly the same way as the funnel of a sand mould in an ordinary iron or brass foundry. The process is known as injection moulding, and the products have widely varying uses in fancy goods and household accessories that need to be practically unbreakable yet flexible to a certain degree. Examples that come to mind are spectacle frames, toothbrush handles, salad servers, knitting needles, egg cups, lemon squeezers, and accumulator jars.

One of the most beautiful articles I have ever seen in which all the predominant details are moulded is the "Purma Special" camera, moulded by Thos. de la Rue and Co. Ltd. Apart from the optical system the whole design is in Bakelite, including all such details as the film winding gear and the view finder. A very clever use is made of the slight flexibility of moulded Bakelite, in order to include a snap-fitting back; also, the covering of the body with shallow grooves—a simple matter to mould—makes the camera easy to handle, and moreover provides a surface that does not fingermark.

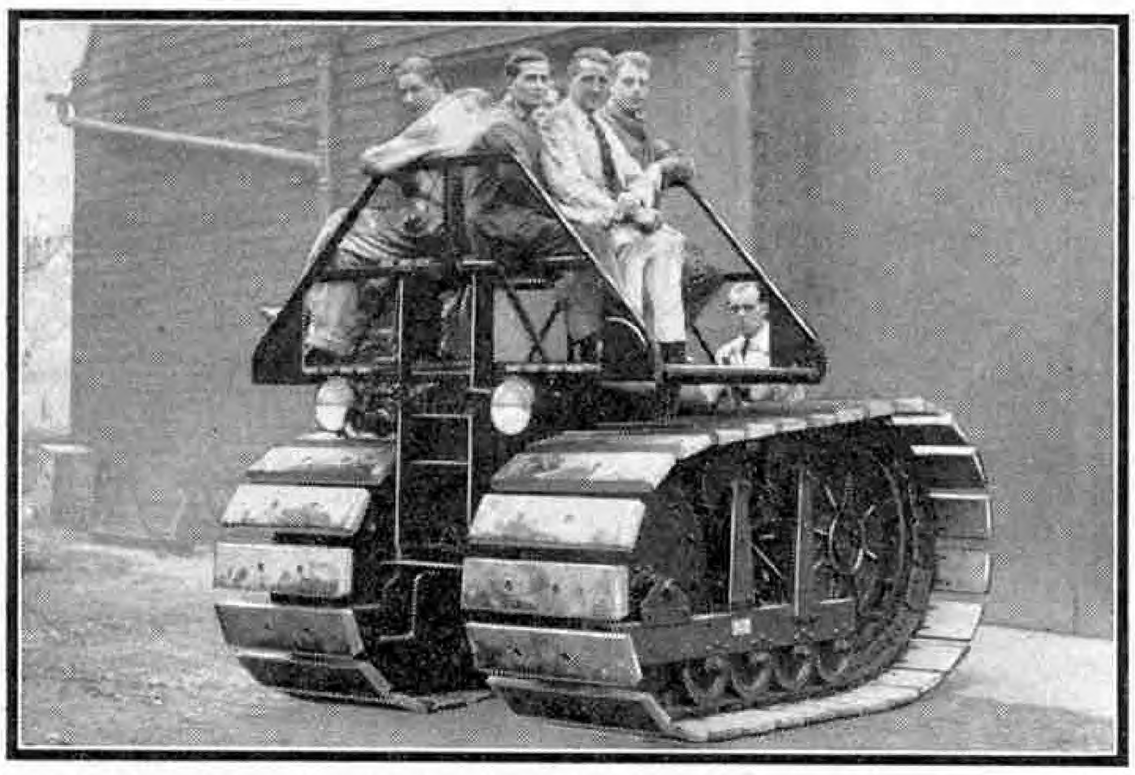
There seems no end to the variety of uses to which plastics can be put. One of the latest developments is the manufacture, from plastics, of lenses for both ocular and photographic use. Bakelite, suitably re-inforced, is actually being used for the hubs of airscrews.

Tractor that Travels on Swamps

Unique Vehicle for Oil Prospectors

IN some parts of the oil-producing districts of the East, ground that usually is hard and dry may be flooded as the result of a rise in a river or a tropical rainstorm. It then becomes a morass of mud, varying in consistency from hour to hour as the floods subside. In dry weather parties of oil prospectors can travel over these areas by motor car, but if they are caught in a sudden storm, the soil rapidly softens to such an extent that a wheeled vehicle becomes absolutely useless. The driver and his passengers are then stranded until the water drains away and the mud hardens. This may mean that they are isolated for many days without food or drinkable water, and there have been occasions when prospectors unlucky enough to be trapped in this manner have been kept alive only by supplies dropped from aeroplanes.

In an attempt to solve the problem of transport in these difficult conditions, Roadless Traction Ltd., Hounslow, have recently designed the special tractor shown in the upper illustration. It is based on an ordinary Fordson Roadless Tractor of the type normally supplied for agricultural and other purposes, and is fitted with a strong superstructure for carrying men and tools. The tracks of the machine also are extended to provide a greater area of surface in contact with the ground, and in order to help in distributing the weight of the complete vehicle, wooden swamp shoes are fitted to the tracks, as shown in the illustration. These are 2 ft. 6 in. wide, and they actually reduce the pressure on the ground to about $2\frac{1}{2}$ lb. per sq. in., thus enabling the three-ton tractor to ride safely on mud and soft earth into which a vehicle not equipped in this manner would sink deeply.



A special Fordson Roadless Tractor, designed for travelling over swampy ground in the oilfields of the East. It has seating accommodation for six men. Photograph by courtesy of Roadless Traction Ltd., Hounslow.

The swamp shoes are designed with the shape of a wedge, the broad end making contact with the ground first. This has the effect of making them act like teeth, gripping the earth and causing the tractor to move forward without track slip on very soft and slimy surfaces. Even in the worst of conditions a very light trailer of the track-laying type or a sledge might be hauled behind the tractor. The shoes are impracticable on hard undulating ground.

There are many other instances where track-laying power units have advantage over ordinary wheeled vehicles, and a particularly interesting example is provided by the internal transport system adopted at the great Earls Court Exhibition Buildings in London.

The Exhibition Buildings are built over a network of railway lines, and partly on this account the floor of the main exhibition hall is raised to a considerable height above the level of the surrounding ground and the roads leading to the various entrances. At two of the entrances steep approach ramps with gradients of 1 in 5 are provided. Ordinary cars or lorries can travel up these slopes without difficulty under their own power, but four special tractors are available for hauling other vehicles that are not self-moving, or are not sufficiently powerful to mount the ramps without assistance. The lower illustration shows a trolley bus being hauled into position in this manner.



A tractor hauling a London trolley bus into position at Earls Court, London, for the Commercial Motor Exhibition. For this illustration we are indebted to "The Engineer."

Two of the tractors employed at Earls Court are equipped with winch gear for hauling or lowering vehicles up or down the ramps, while the other two are used mainly for hauling vehicles on the level to their allotted positions.

In order to reduce the liability of accidents when a heavy load is being lowered down the ramps, the winch gear on the tractors is equipped with a powerful brake system. This operates on a principle similar to that of the "dead man's handle" employed in the control mechanism of electric locomotives.

Cycling Round the World

The Story of a Great Adventure

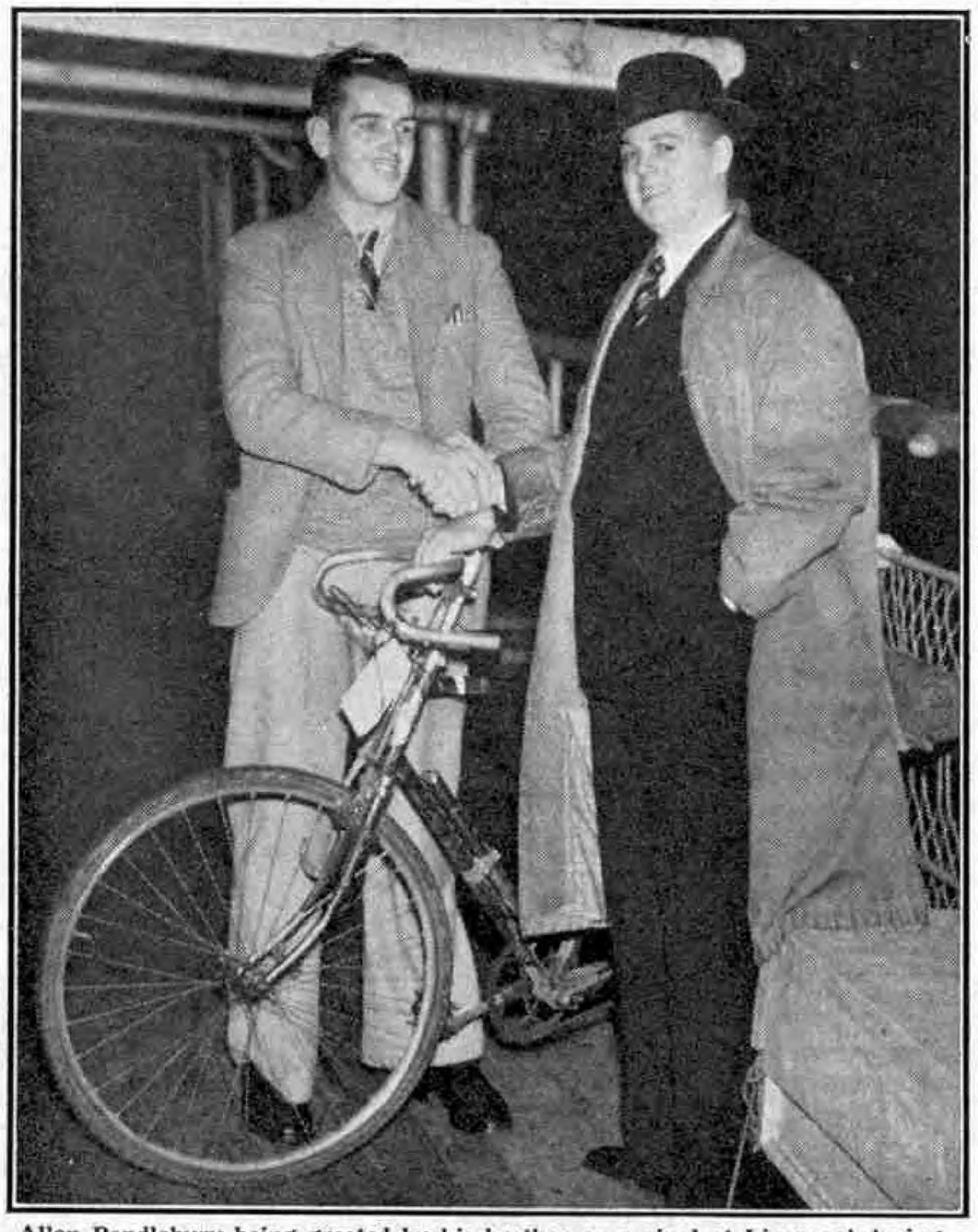
IT is more than 400 years since the survivors of Magellan's famous expedition found their way back to Lisbon after sailing round the Earth, but the desire to follow their example in some form or other still remains with most of us. Some are able to satisfy their longing to see something of strange lands and peoples by a cruise in a large steamship. The aeroplane has given opportunities to others, and the motor car, the motor cycle and even the ordinary bicycle are available for the bolder spirits intent on this wonderful journey.

One of the adventurers who have cycled round the world passed through Liverpool recently on his way back to London, his starting point. His name is Allen Pendlebury, and a little more than two years ago he was a shop assistant in London. While yet a boy he had always wanted to see the world, and the impulse became so strong that he decided to set off, although he could only carry out the journey of his dreams on a bicycle. He was then 24 years old. He celebrated his 26th birthday while he was at Toronto in Canada, and he reached Liverpool, almost at his journey's end, on 24th October last. In the interval he had travelled more than 26,000 miles and had passed through about 27 countries.

The ride began with a journey across Europe. Even in this civilised part of the world he ran into trouble, for in Italy he cycled too near fortifications, the nature of which he did not recognise, and consequently spent a day in prison. Spells in prison seem to be the lot of most adventurers of this kind, for ignorance of the rules and regulations in some strange country, and of the language spoken in it, almost inevitably leads to trouble that is smoothed over easily as soon as explanations can be given. It is interesting to find that Pendlebury almost enjoyed his imprisonment, for he was given good food, which he could not always obtain outside!

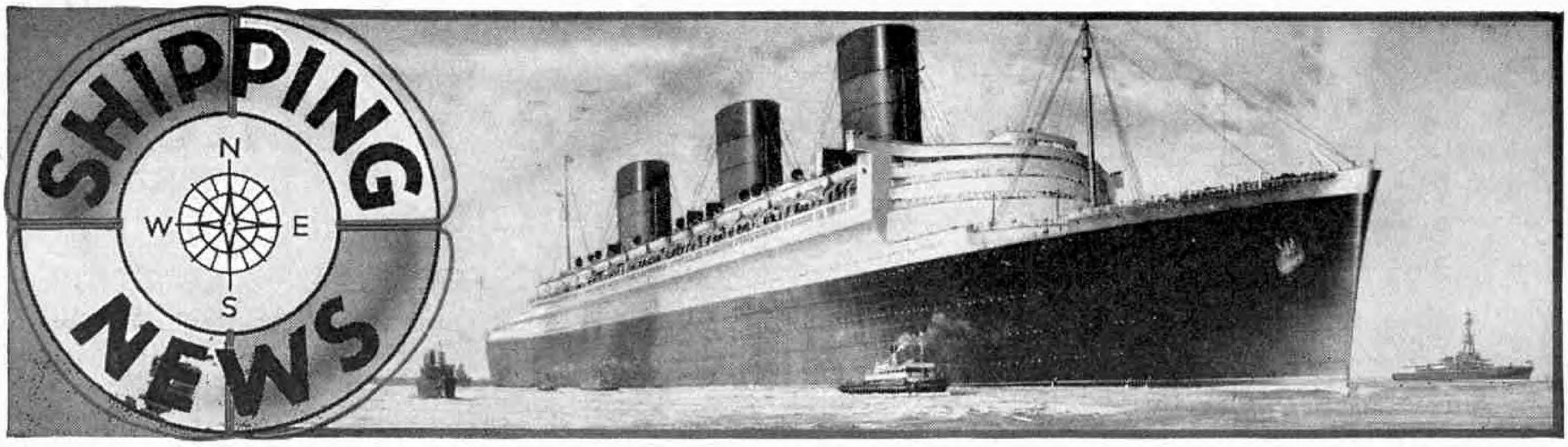
Another thrill came when Pendlebury crossed the deserts and mountains of the Near East. He was forbidden to cycle over the desert from Palestine to Baghdad, two adventurous Americans who had preceded him having disappeared in this lonely and sinister wilderness. Those who set out to go round the world by road are too hardy to be deterred by dangers of this kind, however, and he got safely across, this part of the trip taking 15 days. He met other dangers in Iran, better known by its old name of Persia, where he came across bandits whom he described as "ugly customers waving knives." He had no weapon, but the bandits must soon have realised that he had nothing of value on him, and he escaped unharmed.

On he went through countries of all kinds, enduring hardships and meeting small troubles, but always pushing on with the completion of his journey in view. He could not speak to most of the people whom he met, but he always took care to find the words for bread, water and sleep, and with these as almost his sole conversational equipment he managed splendidly. He found the greatest difficulty in thick jungle country where there were no roads, notably in Sumatra, and after travelling through that country he had to get a new front wheel. Apart from that the machine with which he disembarked at Liverpool to pedal on to London was the same as the one with which he started out more than two years earlier. His achievement was a wonderful one, and every reader of the "*M.M.*" will join in admiration of the pluck and resource that carried him through every trial, and enabled him to complete his great adventure.



Allen Pendlebury being greeted by his brother on arrival at Liverpool during a journey round the world by bicycle. This has taken more than two years to complete. Photograph by T. C. L. Hutchinson.

By a strange coincidence a young Indian Scout unknown to Pendlebury also was travelling round the world on a bicycle, and he is still pursuing his journey. This enterprising youth is Maneh Vajifdar, and he comes from Bombay. His course differs from that of the English cyclist, for after crossing India he sailed to Australia, where he encountered a very hospitable reception. He found China also a pleasant and friendly land, and in the United States, Great Britain and Ireland he was made welcome everywhere. There yet remains for him the journey across Europe and the Near East. He intends to travel through Egypt, and expects that this will take him a year; but he is prepared to stay longer where there is something of interest to see or do, and to extend his journey to yet more countries off the direct line. His bicycle has already undergone transformations that will make it a remarkable memento of his great journey, for it is now equipped with a Chinese pump, a Japanese saddle and American brake-blocks! In Great Britain he is carrying only a rucksack, but in less settled countries he uses full camping gear.



"Conway's" New Figurehead

The new figurehead of the famous training ship *"Conway,"* stationed in the Mersey, was unveiled in September by Mr. John Masefield, the Poet Laureate. Mr. Masefield is himself a former *"Conway"* cadet, and the photograph reproduced on this page was taken shortly after he had performed the ceremony.

The *"Conway"* is a century old battleship formerly known as H.M.S. *"Nile,"* and has recently been overhauled and reconditioned. This work included the fitting of new masts and yards, together with a new deck, all of seasoned English oak, and various internal improvements also have been effected. Finally she was given her new figurehead, a fine headpiece of Nelson. For the unveiling ceremony the grand old vessel was tied up at Princes Landing Stage and suitably dressed with flags.

Can the Water Speed Record be Raised!

Following Sir Malcolm Campbell's successful efforts to raise the water speed record, speculation is rife as to whether the limit has been reached. During the past six years the record has been increased by only about 5 m.p.h., while the land record has been advanced by over 100 m.p.h.

Sir Malcolm is confident that his new *"Bluebird,"* building at the moment, will be capable of improving the record. The experience he has gained this year has proved very valuable, for varied conditions have been encountered and his skill and his boat were tested to the utmost. Sir Malcolm is considering the Great Salt Lake, in Utah, not far from the scene of the land speed record runs, as the scene of further attacks on the record. The altitude of the lake is 4,200 ft., however, and at this height *"Bluebird's"* engine would have a lower power output than at sea level, although a supercharger might make up the difference.

High-Speed Motorship on Trial

The passenger motorship *"Basarabia,"* built by Burmeister and Wain Ltd., Copenhagen, for the Serviciul Maritim Roman, Bucharest, attained a maximum speed of 25.7 knots on her trial trip recently. This vessel has a length of 405 ft. and is driven by two 7,200 i.h.p. 12-cylinder oil engines. Each engine registered a maximum output of 11,000 i.h.p. on trial.

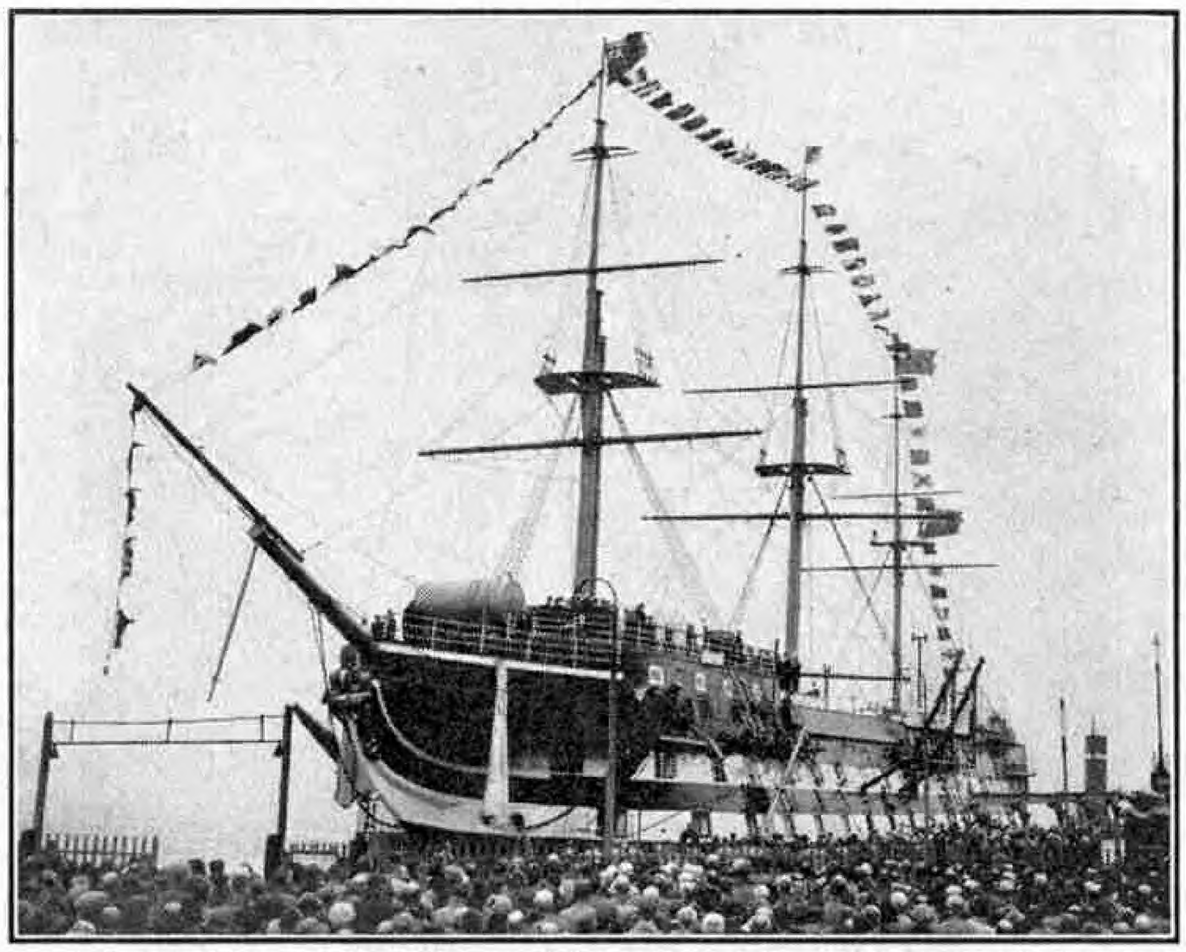
Neon Signs at Sea!

At Whitley Bay, Northumberland, posts marking the limits of the measured mile used during ship trials have been fitted with neon lights to enable them to be more clearly seen. Recently it was reported that the posts could be clearly seen in daylight from a distance of over 6 miles out at sea. Thus during normal trial runs, which take place about 3 miles out, the lights should be very easily seen.

There are four posts in the Bay. They were erected in 1895, and each is about 100 ft. in height. Some 1,200 yards of submarine cable had to be laid to supply the current for the lights, which consist of 20 ft. lengths of double-row neon tubing 30 mm., or a little more than 1 in. in diameter.

Catching Large Fish Alive

A novel boat built in America has special features that allow sharks, porpoises, giant rays and other large creatures to be caught easily. The fish or mammal will be drugged by means of a hypodermic bullet, and will then be floated into a tank run out through an open trap door. The catch will be removed after the tank has been drawn back into the hull of the boat. Fish and other creatures caught in this manner will be taken to two large aquaria near St. Augustine, in Florida.



A scene during the unveiling of the new figurehead of the training ship "Conway" at Liverpool. The figurehead represents Lord Nelson in uniform. This photograph and the lower one on the opposite page are by T. C. L. Hutchinson.

British Life-Boats' Busiest Summer

The past summer has been the busiest ever in the record of the Royal National Life-boat Institution. Between 1st May and 30th September there were 188 life-boat launches round our shores and 188 lives were saved. This was an average of more than eight launches a week, the largest number in any summer since the service was established 114 years ago. From 1st January to 30th September there were 333 launches. Life-boats had saved or helped 220 boats and vessels, and 423 people had been rescued.

The Institution has awarded its bronze medal for gallantry to coxswain John Gill, motor mechanic Joseph Doyle, and five members of the crew of the Galway Bay, Ireland, motor life-boat for their rescue of 16 men from the trawlers *"Nogi"* and *"Hatano"* recently. The *"Nogi"* went ashore in a heavy sea, and four members of the crew of the *"Hatano"* who went to their aid in a boat immediately got into difficulties themselves. The life-boat first went to the assistance of the small boat, which was then very near the rocks, but as she ran alongside the boat's rowlock caught in her fender, and there was danger of a serious accident. The motor mechanic jumped aboard the boat and smashed the rowlock with a hatchet. The four men were then rescued and their boat towed away.

It was impossible for the life-boat to get alongside the *"Nogi,"* but five of her crew manned the small boat, and in two journeys rescued the 11 men on board her. One man from the *"Nogi"* had been swept away when the vessel struck, so the life-boat went in search of him, to discover him dazed and exhausted, eight hours later. Altogether the life-boatmen were out 14 hours.

New Gunboat for Service in China

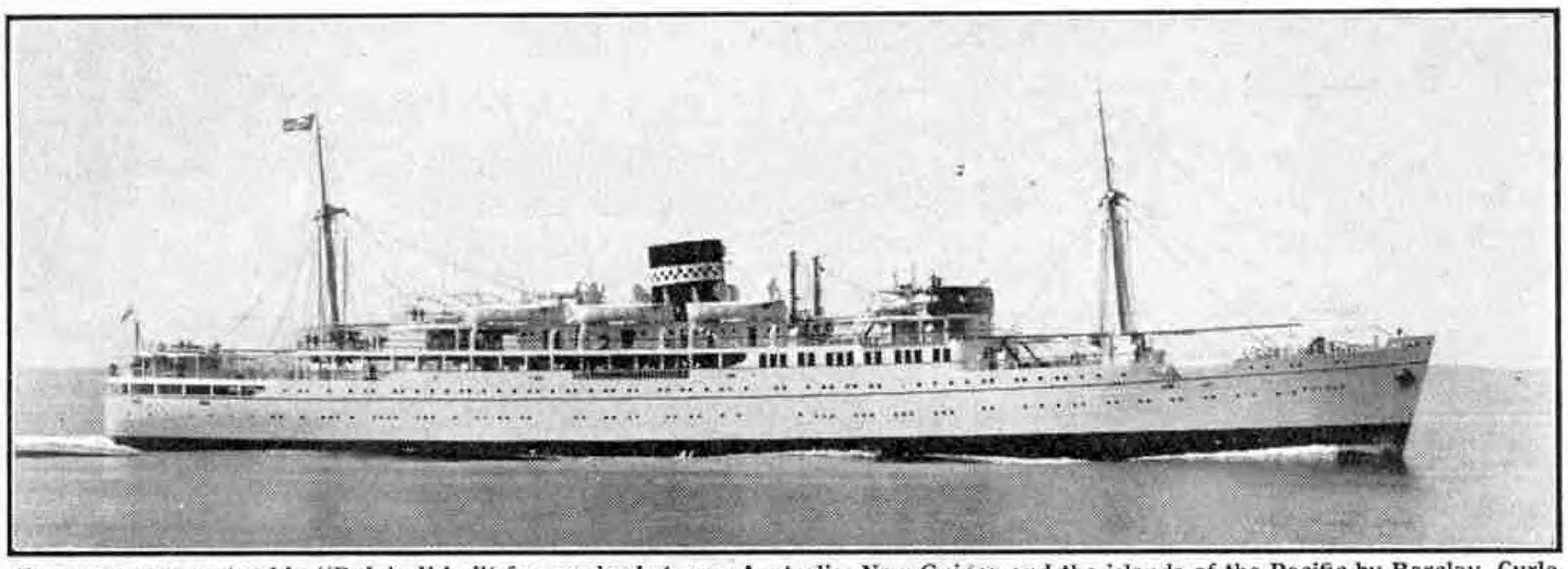
In September J. Samuel White & Co. Ltd., of Cowes, I.O.W., completed H.M. river gunboat *"Scorpion,"* which immediately left for Hong Kong, where she will act as flagship on the Yangtse River. The *"Scorpion"* is 200 ft. long, with a displacement of about 670 tons. She is armed with two 4-in. guns, one 3.7 in. howitzer and 13 smaller guns. Accommodation is provided aboard for the Admiral and his staff, and officers and men. The propelling machinery comprises two sets of geared turbines of 4,500 s.h.p.

Clyde-Built Liner for Australian Services

The twin-screw motorship *"Bulolo"* shown in the upper illustration on this page is a noteworthy example of the smaller type of passenger vessel. She was built to Lloyds highest survey, and fulfils all the latest requirements of the Board of Trade and Australian Government.

The vessel was built by Barclay, Curle and Co. Ltd., of Whiteinch, Glasgow, for Burns, Philp and Co. Ltd., of Sydney, for their services between Australia, New Guinea and the islands of the Pacific, and was handed over in September. Her gross tonnage is 6,500, and she has an overall length of 412 ft. 6 in. The propelling machinery consists of two single-acting Burmeister and Wain Diesel engines, working on the two-stroke cycle. Each engine has six cylinders, and the two together are capable of maintaining a maximum output of 6,130 b.h.p. at 125 r.p.m. Four Ruston and Hornsby 225 kW direct current electric generating sets are installed, the voltage being 220.

Accommodation is provided for 223 first-class passengers, and 16 second-class. Native passengers are provided for in special accommodation 'tween decks aft. For handling cargo there are five large hatches served by 10 electric winches and 15 derricks, and a 20-ton derrick is installed.



The passenger motorship "Bulolo," built for service between Australia, New Guinea and the islands of the Pacific by Barclay, Curle and Co. Ltd., of Glasgow, to whom we are indebted for our photograph.

England-Capetown Record Crossing

In the *"M.M."* for January 1938 we described the modernising of the Union-Castle liner *"Arundel Castle,"* the first of five vessels of that line to be dealt with in this manner. The purpose of the changes was to speed up the company's mail service between Southampton and Capetown. The other four vessels concerned were the *"Windsor Castle,"* the *"Caernarvon Castle,"* the *"Warwick Castle"* and the *"Winchester Castle."* The work has now been completed, and all are in service again, together with the new ships *"Stirling Castle"* and *"Athlone Castle."*

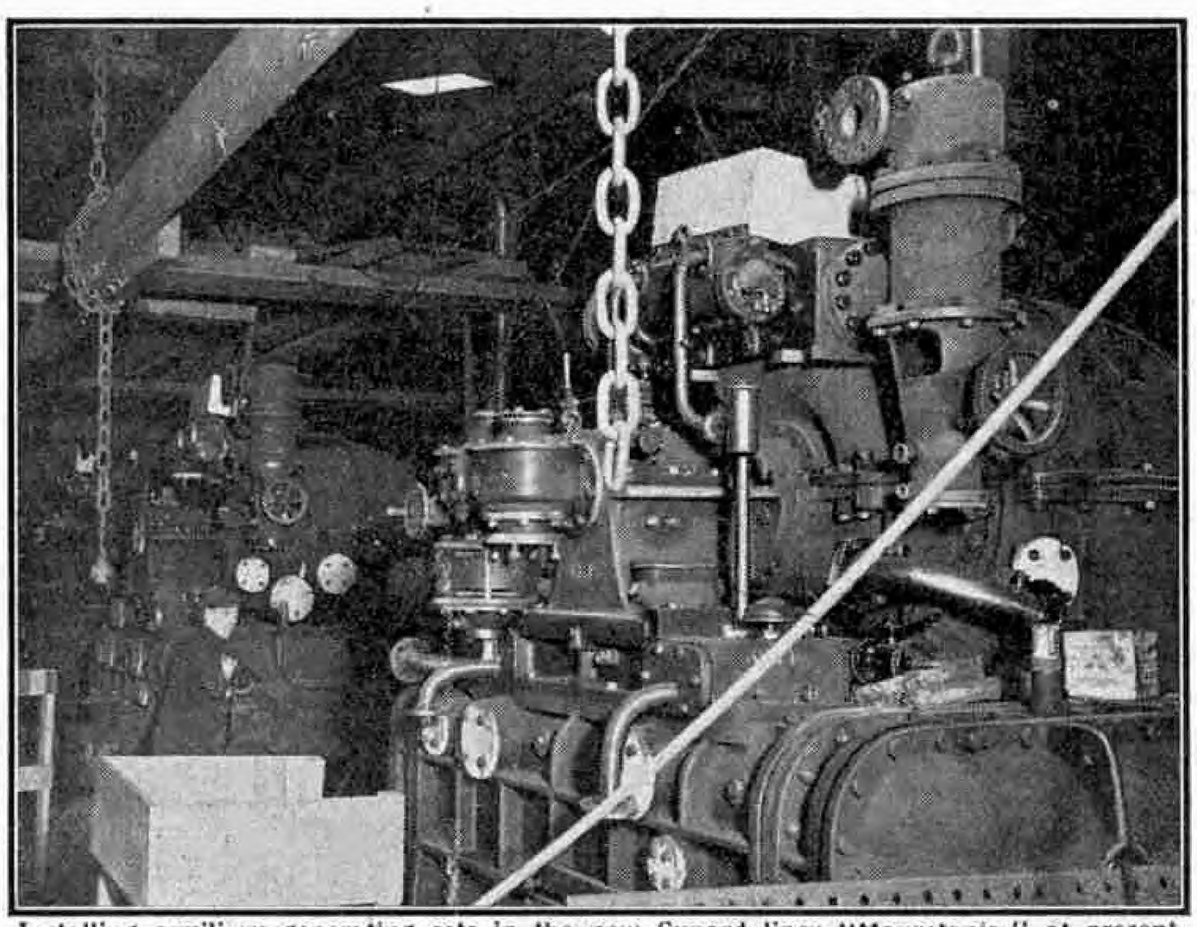
The projected all-round acceleration will be put into operation on the 22nd of this month with the departure from Southampton of the *"Athlone Castle."* Liners on this service will then leave outward bound on Thursdays instead of on Fridays, as at present, and the voyage will be completed in 13½ days, a saving of more than a day on the old timing.

Last September the *"Caernarvon Castle,"* the second vessel to be altered, set up a new record for the Southampton-Capetown passage. She completed the run in 12 days 18 hrs. 38 min., easily eclipsing the former record of 13 days 5 hrs. 20 min.

Salvaging a 17,500-Ton Liner

In 1937 the Japanese 17,500-ton liner *"Assama Maru"* ran aground in Hong Kong harbour on her maiden voyage during a typhoon in which wind speeds of 167 m.p.h. were registered. Her draught was shallow at the time, and this, coupled with an abnormal tidal rise of 5 ft., caused her to be lifted so far ashore that salvage measures were rendered extremely difficult.

After examination it was estimated that it would be necessary to lighten her by as much as 6,500 tons before she could be refloated. Unfortunately there was almost no cargo to remove, and so all water, fuel, anchors, boats and other movables aboard, together with two of her four engines, were lifted out. Even this was not sufficient, however, and 10 buoyancy tanks each with a lifting capacity of about 50 tons, had to be fitted around the hull. A channel was then cut to allow the ship to reach deep water. This necessitated the removal of about 7,800 tons of rocks, clay and other material, and 25,000 charges of dynamite were exploded during this work.



Installing auxiliary generating sets in the new Cunard liner "Mauretania," at present fitting out at the Birkenhead yard of Cammell Laird and Co. Ltd., her builders.

The ship was eventually refloated, six months after she had grounded. Temporary repairs were made at Hong Kong, and the *"Assama Maru"* was then taken to Nagasaki, where she was thoroughly overhauled and renovated before beginning her "maiden" voyage all over again.

New Motor Life-Boats

The modernisation of the fleet of Royal National Life-Boat Institution is progressing rapidly, and three more new boats were recently put in service, replacing older and less efficient craft.

Boats of the powerful Watson cabin type fitted with two 40 h.p. Diesel engines have been stationed at Wick and Appledore respectively. The Appledore boat has been specially strengthened in view of the abnormal conditions under which she will work. A strong stern frame is fitted beneath the rudder to protect it should the boat strike when crossing the bar, and the after canopy that shelters the coxswain and motor mechanic has been carried over the engine room. The boat also has whalebacks forward and aft instead of the usual flat deck.

A light surf boat of the latest type has been stationed at Newbiggin. Its two 10 h.p. engines drive Hotchkiss internal cone propellers, and the speed is 7 knots. The range without refuelling is 50 miles.

In the R.N.L.I. fleet there are now 138 motor boats and only 26 pulling-and-sailing craft. The latter are to be replaced in the near future.

Kort Nozzle for Mersey Tug

The steam tug *"Maycock,"* of the Liverpool Screw Towing and Lighterage Co., was recently fitted with a Kort nozzle by Cammell Laird and Co. Ltd. This novel device consists of a streamlined steel nozzle fitted around the propeller, just clear of the tips of the blades. It was designed to reduce the wash left by a vessel, and so lessen erosion on canal or river banks, but was found to give greater propelling power, a feature that was well demonstrated during the trials of the newly-equipped *"Maycock."* With this vessel, the engines of which are of 650 h.p., a static pull of 7¼ tons was registered without the nozzle, the fitting of which increased the pull to 11 tons. It was estimated that machinery of 1,000 h.p. would be required to give the increased pull if the vessel were not fitted with the Kort nozzle.

Famous Shipping Lines Merge

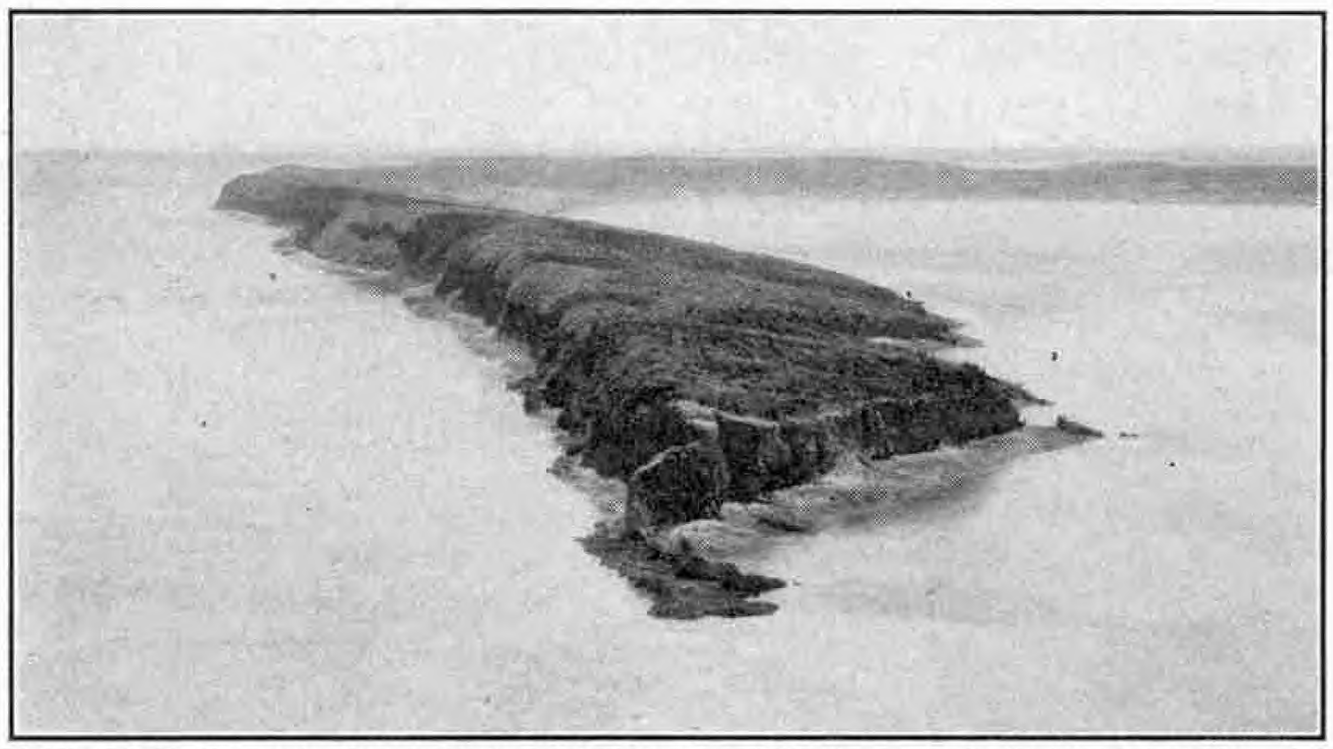
The Pacific Steam Navigation Company has been acquired by the Royal Mail Lines Ltd. The P.S.N. fleet of six steamships and nine motorships, aggregating over 120,000 tons gross, is now added to that of the Royal Mail Lines, which already controls 22 steam and 12 motorships, with a total gross tonnage of over 300,000.

The Bay of Fundy

Where the World's Highest Tides are Recorded

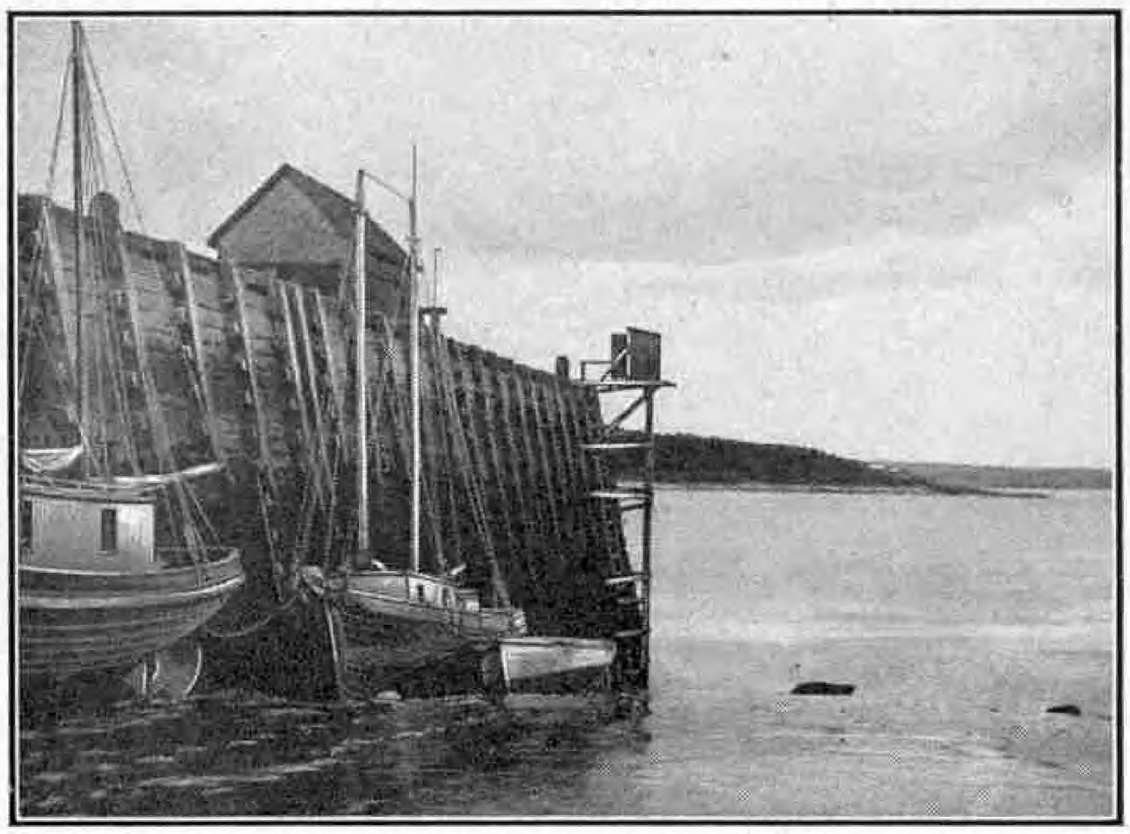
By H. E. M. Kensit, M.E.I.C.

Of the many natural wonders in North America perhaps none is more worthy of study than the Bay of Fundy. Its features are not merely spectacular, for the chief one offers great commercial possibilities. Its tides are famous at every place in the world where tides are measured and recorded, but just why are they higher within this Bay than at any other point in the world? Its tidal power possibilities are also unequalled—just how do they compare with the world's greatest tidal power projects? Its Reversing Falls are another notable feature—just why do they reverse? These questions, and the tidal power possibilities in particular, led the writer, as a power engineer, to keep watch for a number of years on the local conditions in the Bay.



At Cape Split, the promontory near the head of the Bay of Fundy shown in this photograph from the air, the average height of the tide is about 50 ft. Royal Canadian Air Force photograph.

Now for the cause of the great rise of water level at high tides within the Bay. This is not due to any unusual height of tide on the open sea at this point, but entirely to the physical conditions within the Bay itself. The Bay of Fundy, which lies between the provinces of Nova Scotia and New Brunswick, is about 160 miles in length from Grand Manan Island in its entrance to the end of Chignecto Channel at its head, and forms a funnel-shaped body of water about 50 miles wide at its mouth and tapering to narrow points at its branch heads. In addition to this funnel shape the Bay has the remarkable feature that its bed slopes upward on an approximately even gradient from a depth of about 400 ft. at its mouth to little or no depth at its branch heads. In fact, at its extremity it terminates in mud flats reaching in places to a distance of over three miles. It is estimated that there flow into this Bay with every tide some 2,000 million tons of water. It is the combined effect of the funnel shape and the rapidly rising bed of the Bay on the vast mass of inpouring water that gives the piling up effect, and causes the great rise of water level.



The tides in the part of the Bay shown here rise over 46 ft. Photograph by courtesy of H. W. Jones, Canadian Tidal and Current Survey.

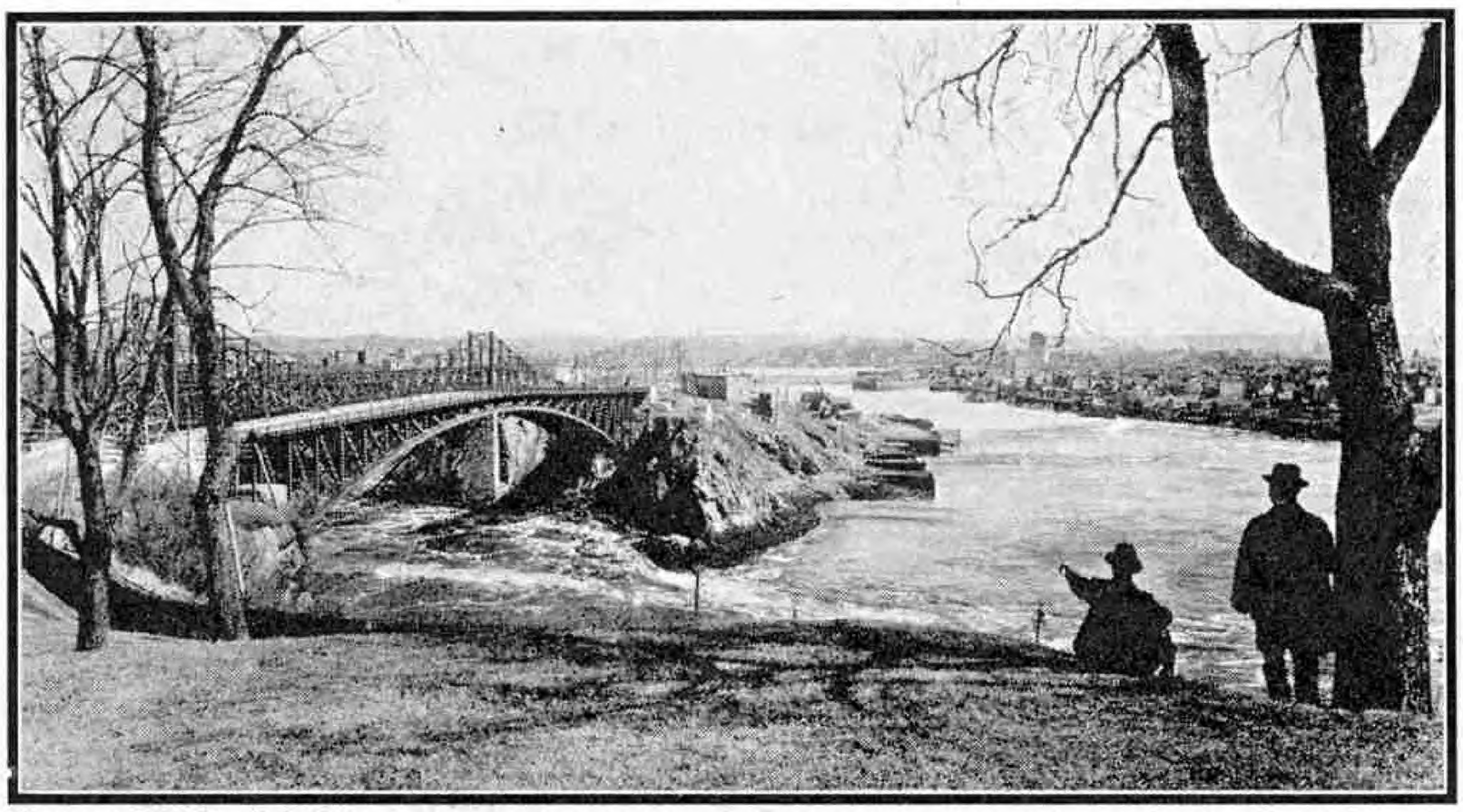
Now to visualize properly the action of tides, one must begin at the beginning. Tides originate in the Southern Ocean and pass into the Atlantic and Pacific Oceans. The tidal wave traversing these seas in mid-ocean seldom exceeds 2 ft. in height, but as it reaches the shallow waters and irregular outline of the coasts it is subjected to many influences and varies greatly in height and effects. According to the Tidal and Current Survey, the Canadian coast furnishes "examples of every kind of tide that is found anywhere in the world—in range they vary from almost nothing to amongst the highest in the world." Thus at Halifax, Nova Scotia, which is on the shore of the open ocean, the mean rise of spring tides is a little over 6 ft.; at Minas Basin, separated from Halifax only by the narrow width of Nova Scotia, but well up in the Bay of Fundy, the rise is about 50 ft. or eight times as much as it is at Halifax.

This gives a good idea of the piling up of the waters due to the funnel shape and rapidly rising bed of the Bay. These are the "mean" figures, however, and we must also look into the maximum rise, which occurs in the lower or eastern arm of the Bay at Burntcoat Head and Noel Bay. Here the tide may rise 53 ft., which is the greatest height it reaches except in storms. With the aid of a storm a maximum of close to 57 ft. was reached in 1869. This is known as the Saxby Tide. The next highest tides ever recorded appear to have been at Chepstow in the Bristol Channel, England, where there was a rise of nearly 49 ft. in 1883, and in the Straits of Magellan, at the southernmost end of South America, spring tides rise in the narrows to a height of about 43 ft.

The Bay of Fundy produces not very large but interesting tidal bores in several of the rivers that empty into it. A "bore" is a turbulent wave of tidal water above the

level of the river, up which it advances at a more or less rapid pace. The largest bore in the Bay of Fundy is that in the Petitcodiac estuary, which forms about 8 miles below Moncton with a crest from 3 ft. to more than 5 ft. in height, and travels to a point about 13 miles above that city at some 8 miles per hour.

One of the most unusual spectacles that the Bay of Fundy provides is the Reversing Falls on the St. John river. These are at the city of St. John, and form an accessible and fascinating sight that the writer has watched throughout on many occasions. Near its outlet the St. John river expands into a large basin; then it passes through a narrow gorge of solid rock and discharges into the great area of the Bay of Fundy. The gorge therefore chokes both the outflow of the river and the inflow of the tide. The tidal range at this point is over 20 ft., so that the water in the Bay rises high above the level of the river and forms a waterfall in the up-stream direction. As the tide falls the process is reversed, and the result is a waterfall from 3 ft. to more than 5 ft. in height maintained twice daily in each direction for some six hours. Nevertheless navigation past this point is practicable at slack water for about 1½ hr. twice daily.



The reversing falls of St. John, New Brunswick. They are shown flowing seaward, but the water changes its direction as the tide rises and falls. Photograph by courtesy of the Department of Trade and Commerce, Canada.

So far the features of the Bay of Fundy that we have described have been spectacular, but far from useful or advantageous. Now we come to the utilitarian aspect—the opportunities for tidal power development created by the high tides, and by the natural facilities for creating reservoirs to store the water carried by those tides. It may justly be said that the tidal power possibilities are amongst the greatest in the world, and that the main reason for not proceeding with development is that there is not yet a market for the enormous amount of power that would be made available. The largest site is that at Passamaquoddy Bay, near the mouth of the Bay, and as this is on the international boundary it would be necessary to organise a joint undertaking by Canada and the United States. This would yield over 1,000,000 h.p. continuously. The prospective power has been estimated by the engineers of the United States War Department, and a Bill to authorize it passed the Dominion House of Commons in 1927, but subsequent opposition caused Canadian support to be withdrawn.

It is of interest to note that in point of cost the Passamaquoddy scheme appears the most favourable of the three leading tidal power projects in the world that have been investigated by the governments concerned. The cost of the Severn River scheme in England, which would yield 1,224,000 h.p., would be about £30 per h.p., and the corresponding figure for a great 1,412,000 h.p. scheme suggested in Argentina would be nearly £25. The cost per h.p. of the Passamaquoddy scheme would be only about £18.

There is a very good two-basin site at the other end of the Bay that would give about 200,000 h.p., and several other schemes have been projected. It has been officially estimated that the total tidal power available from the Bay of Fundy would be 3,500,000 h.p.

Now we may review the striking features of the Bay of Fundy and consider how they compare with records at other places. The height of the tides at the head of the Bay does not appear to be equalled at any other place in the world; the Reversing Falls at Saint John are probably unique in extent and regularity; and the tidal power resources of the Bay are among the three greatest in the world. As to the tidal bores, however, those of the Bay of Fundy are surpassed by many. The greatest and most remarkable bore in the world is that on the Tsien-Tang-Kiang River, which flows into the China Sea. Here are all the conditions necessary to form a great bore. There is a high initial tide of 12 ft., an estuary converging to one-fifth of the width at its mouth, an extensive area of sand and a bar, and the bore is formed at every tide. As described by Captain W. Osborne Moore, R.N., it enters the river with a width of 1,800 yd., or over a mile, on a concave front 8 ft. to 12 ft. high, but back of the advancing crest there are formed secondary rollers reaching to 20 ft. and sometimes 30 ft. above the level of the river in front of the bore, thus giving a total height that may be 40 ft. or more.



Cumberland Basin, at the head of the Bay of Fundy, seen from the air at low tide, showing dykes built to protect cultivated land. Royal Canadian Air Force photograph.

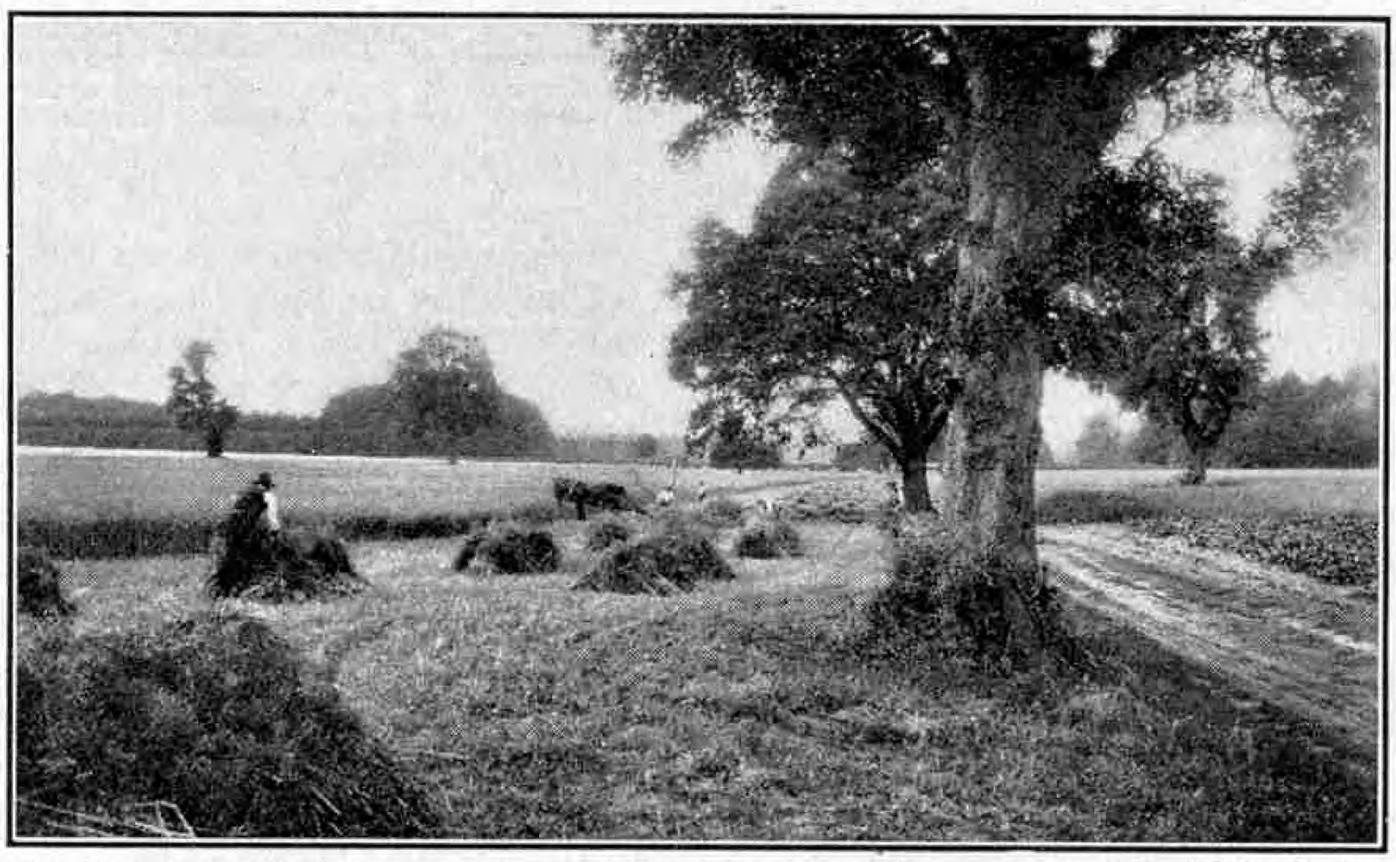
Mustard for the Million

The Romance of a Famous Industry

By J. Carmichael Johns

MUSTARD is not only interesting because making it constitutes a modern industry, but because that industry arose out of a one-man, or in this case a one-woman concern. The spice itself has been known from earliest times. The Greeks knew its curative and flavouring properties, and Shakespeare mentions it; but mustard as we know it is a comparatively recent invention. As late as 1720 it was served at table in its natural form, round seeds which the diner had to crush with his knife on the side of his plate. At about the end of the 18th century, however, a certain Mrs. Clements of Durham set up a small pestle-and-mortar in her kitchen and ground her mustard before delivering it to customers. The product became quite famous; she did a roaring trade all over the country, and won the appreciation of King George I.

Various small mustard mills sprang up, but it fell to the lot of one Jeremiah Colman to perfect the process in England and make it into a thriving industry. Certainly the original "powdered mustard," consisting of ground seed-case and all, left room for improvement. Old Jeremiah worked hard, and out of his labours arose Carrow Works, Norwich, staffed by 2,000 workers, and covering an area of 52 acres. To-day the works can boast 20 other products, including starch and porridge; but it is true to say that the firm was built up on the mustard for which it is world famous.



Harvesting mustard in East Anglia. The crop is reaped and threshed like any other grain. The illustrations to this article are reproduced by courtesy of J. and J. Colman Ltd., Norwich.

Acres of the beautiful yellow flowers of mustard can be seen in June over most countrysides of East Anglia and Lincolnshire. There are two varieties, commonly known as white and brown mustard respectively. The two kinds of seed are very different in appearance, the "white" being a creamy yellow, about three times the size of the "brown." Mustard contains up to 35 per cent. of fat; the "hot" taste and skin-irritant properties are almost all due to the volatile oil formed when the brown variety comes in contact with water. To make a satisfactory table mustard the two must be correctly mixed, and the present-day fine quality condiment is the result of many years' blending experiments which, to a certain extent, must always continue, as the quality of "raw" mustard alters from year to year. In the same way the actual yields of harvest are not constant, and Colmans must keep vast stocks of seed to avoid any possibility of being short of any particular grade.

The seed, which is harvested and threshed like any other grain, is graded and thoroughly cleaned, and then conveyed to the mills. Here it is subjected to rolling action, which reduces the seed-cases to bran and their contents to "farina" or flour. The brown seed, owing to its higher fat content, goes through more stages than the white. One of the most important principles of the whole process is to preserve the seed's oil content. The action of ordinary rollers obviously tends to crush out the liquid matter from fatty seeds, but the processes at Carrow Mills are now so perfect that no mustard-oil is lost through rolling.

The flour is now separated from the husks, or bran, by a number of sieving processes. How fine the flour is can be judged from the fact that the mesh of some of the sieves contains 29,000 holes per sq. in.

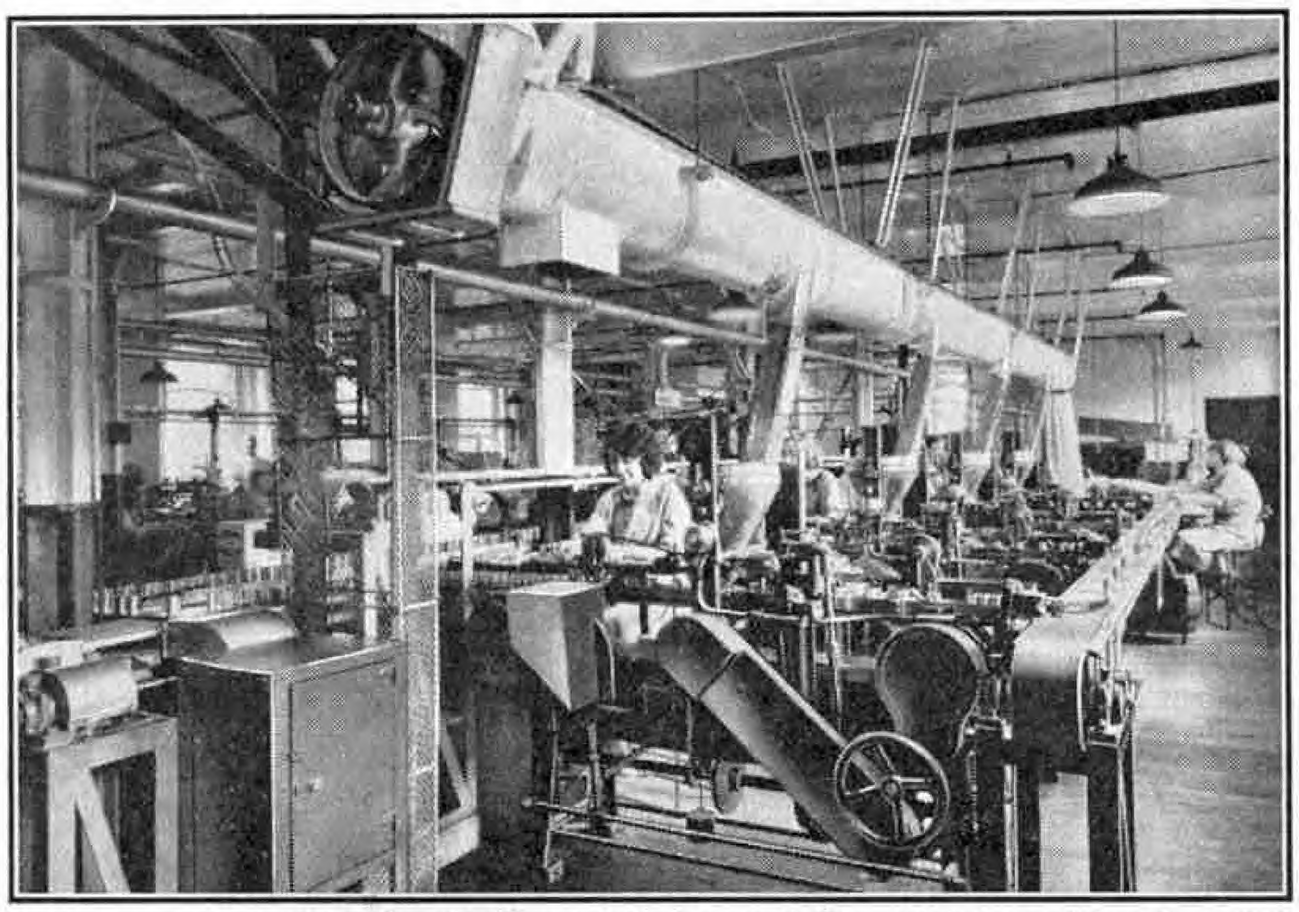
The mustards are now in the form of white flour, brown flour, and their respective brans. The last might once have been considered "waste." The success of any industry depends upon its capacity for turning by-products into something saleable, however, and this is scientifically carried out at the mills. The brown bran, as previously explained, is stronger and contains more of the volatile oil principle. Part of it is packed and sold to clinics and similar medical institutions for use in poultices, packs, and our old friend the mustard bath. A larger quantity is subjected to hydraulic pressure to extract oil, and ends up after numerous processings in such diverse products as mustard ointment for rheumatism, insecticide spray, and lubricating oil.

The oil-free bran is by no means wasted; part finds its way into cattle fodder, but its most important sale is as manure, for which purpose it is pressed into cakes by hydraulic pressure. Mustard manure, apart from its value as a fertiliser, has a reputation for being able to eliminate the wire-worm pest. The varying explanations offered for this are worth noting. One group of farmers say that wire-worms just don't like mustard; but there are as many others who will tell you quite cheerfully that the wire-worms are so fascinated by mustard that they eat it until they burst!

So much for the so-called waste. The white and brown flours pass on to the mixing process that will

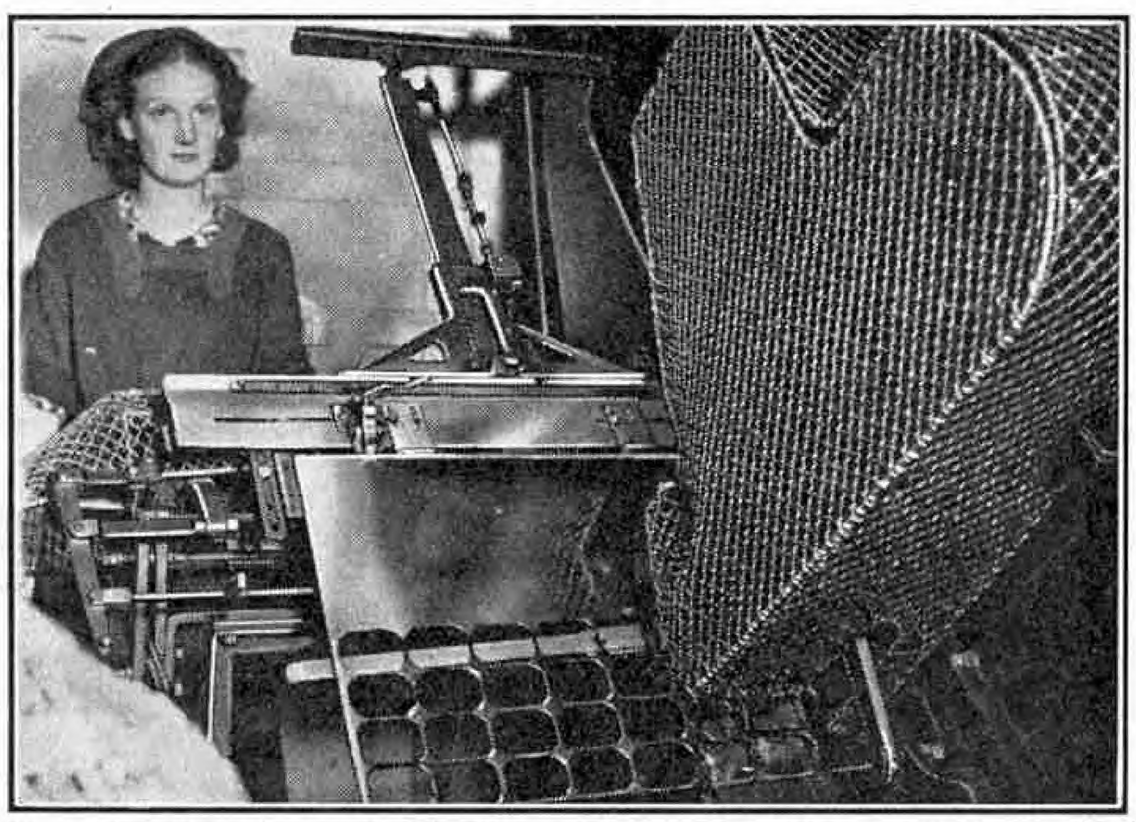
convert them into table mustard as we know it. Mixing takes place in 1½-ton hoppers, after which the product is given a final sieving and then passes on to the packing depot.

A self-contained business is a profitable business, so every metal container that leaves Colmans is made on the spot. The tin, which is thin sheet iron coated on both sides with pure tin, arrives at Carrow in convenient sheets. These are at once conveyed to the tin shop, where they are first passed through rotary cutters that turn them out split into the required sizes. The cut pieces are taken to the body-forming machines, of many different types according to the mustard container required. These incredible pieces of mechanism, some of them turning out tins at the rate of 250 a minute, bend or stamp the strips into exact shape, assemble them, and finally secure the joints into a flanged seam. Next time you look at a mustard tin remember that it was only one of thousands turned out quicker than you could count. Part of the production speed is due to the conveyor belt that joins every unit in the tin shop.



Packing twopenny mustard tins. Small automatic hoppers deliver weighed quantities of mustard to tins passing beneath them on a conveyor.

In the case of containers designed for export, the seams are soldered by hand, their lids are put on, and they are passed on an endless chain under hot water in a glass-sided tank. The heat expands the air inside the tin, and any leakage is indicated by a cloud of bubbles. That is only one of the many ingenious robots whose almost human actions usually defy description. For instance, there is a rotating drum into which the oval lids of 2d. mustard tins are shot by the hundred from the tin shop, to emerge on a conveyor belt all in line and the same way up, ready for the next machine to pop them down on the filled containers. When a sharp difference in level occurs between two units in the tin shop, the partly-made containers are blown along steel chutes from one machine to the other, or back on to the conveyor belt, as the case may be. A formidable task faced by Carrow engineers was to get each conveyor belt running at just the right speed, so that tins falling upon it from the various chutes would remain upright. There was no formula for working out this, so they had to rely on experiment; a big plant comparatively easy to install may take many months to get into perfect running order, and it is here that patience and common-sense count.



Stamping out bases for mustard tins. Some of the machines at Carrow Works, Norwich, can produce 250 tins a minute.

The actual packing is done by small automatic hoppers that fill the container with a weighed quantity of mustard as it passes beneath, and thence pass it on to the lidding and wrapping machines. Once the component strips of a tin clatter into the assembling machine, they never stop until they emerge filled, weighed, sealed, and ready for the market; and they are not touched by hand, the only human factor being in the control and checking of the machines.

Mustard in tons, bales and tins and boxes of it, leaves Colmans every week. In the private goods yard you may find crates labelled for anywhere from the grocer next door to San Francisco or Penang. The two shunting locomotives are worth inspection, by the way. They look quite ordinary until you discover that they carry no coal and have no furnaces, and if you watch long enough you'll see them slink off to the power plant for a boiler-full of compressed steam!

We must not forget the chemists; but for them any factory would soon be facing a pile of trouble. They have two full-time jobs—research to improve their factory's products, and still more research to protect the public. Anything edible comes under the strictest food laws, and it is for the chemists to see that all products conform to the rules and regulations. "What's described on the label must be inside the tin" is one of their mottoes, and means that they must regularly analyse a sample of every product that leaves the factory. All incoming raw materials, such as mustard seed, must be tested for purity, colour, quality, and a dozen other important factors. There is the rarest possibility that some raw material, especially from abroad, may be contaminated or infected, so everything has to have a bacteriological check-up.

Another department is responsible for the reliability of containers and wrappings, and in a special 'humidity chamber' cartons and tins are constantly under test in a warm and damp atmosphere. Again, the colour of wrapping papers must be tested by exposure to a mercury vapour lamp, a few hours of which are equivalent in fading effect to years of daylight.

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THE PERFECT TABLE RAILWAY!



SOME OF THE HORNBY-DUBLO SETS

● EDP1 Hornby-Dublo Electric Passenger Train Set comprising streamlined six-coupled Locomotive "Sir Nigel Gresley," Tender, Two-coach Articulated Unit, Dublo Controller and Rails. (Transformer not included.) Price **70/-**

● DP1 Hornby-Dublo Clockwork Passenger Train Set contains streamlined six-coupled Locomotive "Sir Nigel Gresley," Tender, Two-coach Articulated Unit and Rails. Price **39/6**

● EDG7 Hornby-Dublo Electric Tank Goods Train Set contains six-coupled Tank Locomotive, Open Goods Wagon, Goods Van, Brake Van, Dublo Controller and Rails. (Transformer not included.) Price **55/-**

● DG7 Hornby-Dublo Clockwork Tank Goods Train Set contains six-coupled Tank Locomotive, Open Goods Wagon, Goods Van, Brake Van and Rails. Price **27/6**

★ *DO NOT MISS THIS!*

A Special Folder, beautifully printed in colour, is now available giving details and prices of the complete Hornby-Dublo range. Ask your dealer for a copy, or write direct to Meccano Ltd., Dept. D.F., Binns Road, Liverpool 13.

HORNBY-DUBLO TRAINS

The Hornby-Dublo System, Gauge OO, marks a wonderful advance towards the ideal home railway. By means of it a complete and realistic layout can be developed in very limited space. It is the perfect table railway.

Hornby-Dublo Trains are unique in their scale accuracy and beauty of finish. They have been designed with the co-operation of the Railway Companies, who supplied special photographs and scale drawings. The Trains in motion are fascinating to watch. The Locomotives are fitted with motors, either clockwork or electric, of a power and reliability never before achieved in this gauge. The Remote Control of the Electric Locomotives is perfect—starting, stopping, reversing and speed regulation are all carried out by the movement of one lever. The control is positive. Move the lever to "Forward" and the train goes forward; move it to "Backward" and the train goes backward—every time!

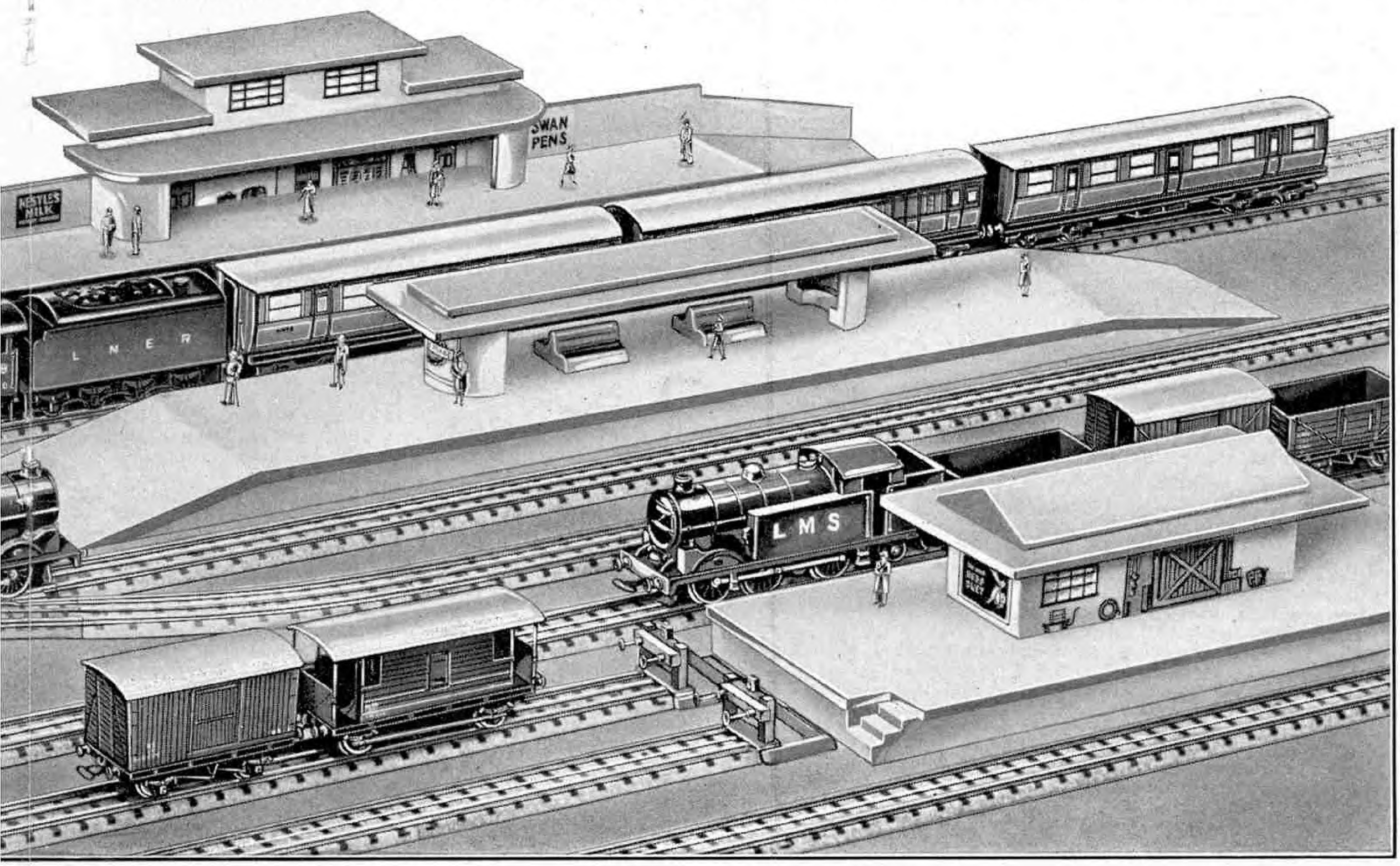
The track consists of solid drawn brass rails, giving the greatest electrical conductivity, mounted on a realistic metal base. All vehicles are fitted with pressure die-cast wheels that ensure perfectly smooth running. Automatic couplings, which link at any point on the track, are fitted to all Coaches, Vans and Wagons. The Signals are realistic working models of the latest upper-quadrant type. The Buffer Stops have working heads.

The Main Line Station, which is constructed in wood, is a splendid model in the modern style. It will accommodate a 3-Coach Train, and by means of printed slips provided can be named "Berwick" (L.N.E.R.), "Penrith" (L.M.S.), "Truro" (G.W.R.) or "Ashford" (S.R.), as desired. An Island Platform of similar style can be used either separately or in conjunction with the Main Line Station. There is also a Goods Depot for goods traffic.

Hornby-Dublo Electric Trains operate on **Direct Current** at 12 volts. This current may be obtained either from **Alternating Current Mains Supply** through a Dublo Transformer, or from a 12-volt accumulator. The Dublo Transformers are specially designed for these Trains, and no others should be used.

Hornby-Dublo Trains are one seventy-sixth of the size of real trains. They enable you to lay out a complete railway on your dining table!

MANUFACTURED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13

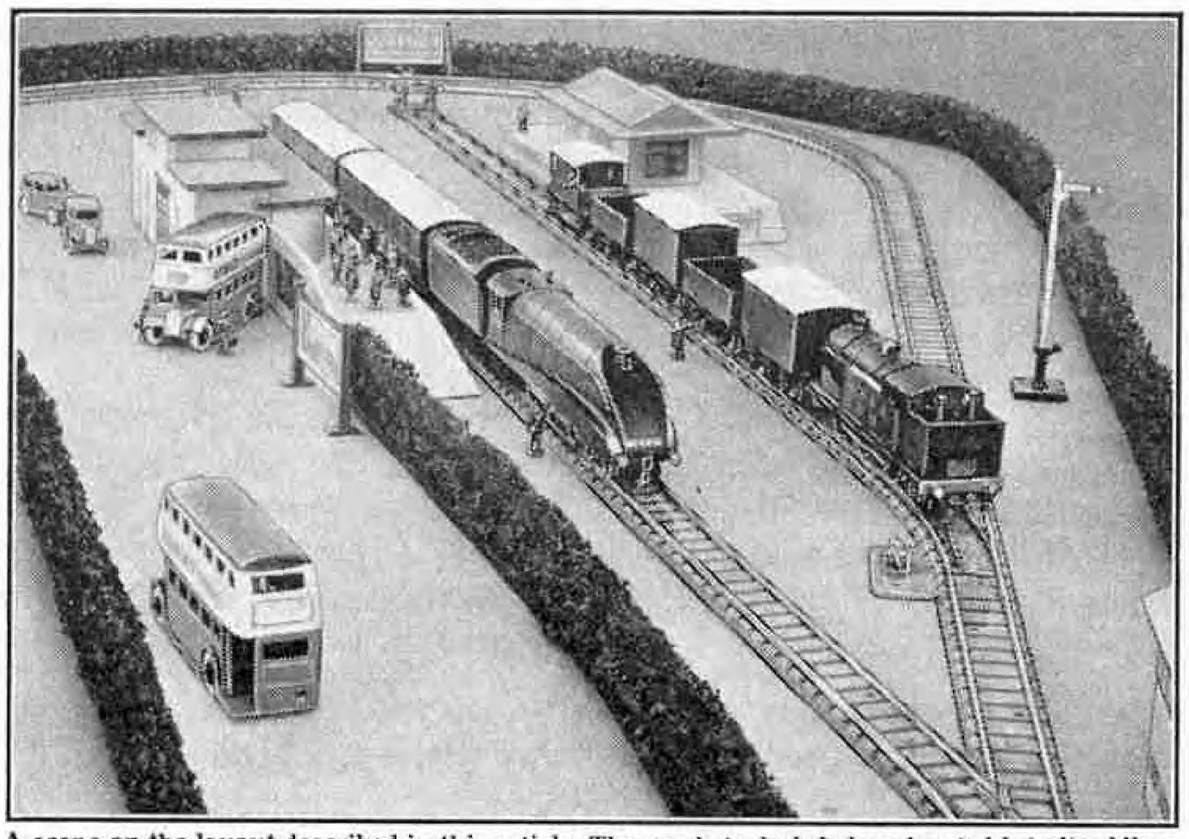


Fun with Hornby-Dublo Clockwork Trains

Running Operations on a Simple Layout

LAST month we dealt with the running of Hornby-Dublo Electric Trains, and described typical operations made possible by their remarkably efficient and positive system of Remote Control. This month we consider the running of Hornby-Dublo Clockwork Trains, and in order to show what fun can be obtained we illustrate on this page a specimen layout, the rails of which occupy a space 6 ft. by 3 ft., and describe typical operations that can be carried out on it with passenger and goods trains.

The layout is an extension of the oval system of rails contained in the Hornby-Dublo Train Sets, to which points and other rails have been added. The main line is oval in form, and has a running loop laid parallel to one side of the oval. From the opposite side two dead-end branch lines turn off inside the main track, and as shown in the upper illustration these can serve a standard Main Line Station and a Goods Depot respectively. Additional stations can be provided alongside the main line, but the exact arrangement of these can be left to the individual model railway owner. The double track formed by the main and loop lines, for instance, could be made to serve a double-road station made up of two Main Line Stations, or a Main Line Station and an Island Platform. Alternatively the loop road need not serve a platform, but can be used simply as a passing loop, or for running-round purposes. The addition of a station outside the track will increase the width of the space required by five inches.



A scene on the layout described in this article. The goods train is being shunted into its siding, in order to clear the main line for the running of the express, which is ready to leave the Main Line Station in the centre of the layout.

In the series of operations to be described we will assume that we are fortunate enough to possess two trains, one passenger and one goods, made up as shown in the upper illustration. The braking and reversing of Hornby-Dublo Clockwork Locomotives is performed by means of levers, which project through the cab roof in the case of the streamlined express locomotive "*Sir Nigel Gresley*," and are found in the bunker of the Tank Locomotive. It is very good fun, however, to see if we can make our clockwork engines stop just where we want them to, without having to touch them to apply the brake. On a given layout it is possible after a certain amount of experimenting to arrange this with great accuracy by varying the number of turns of the key that are given to the engines. Actually, as each twist of the hand when winding moves the key through half a revolution only, it would be more correct to refer to half-turns.

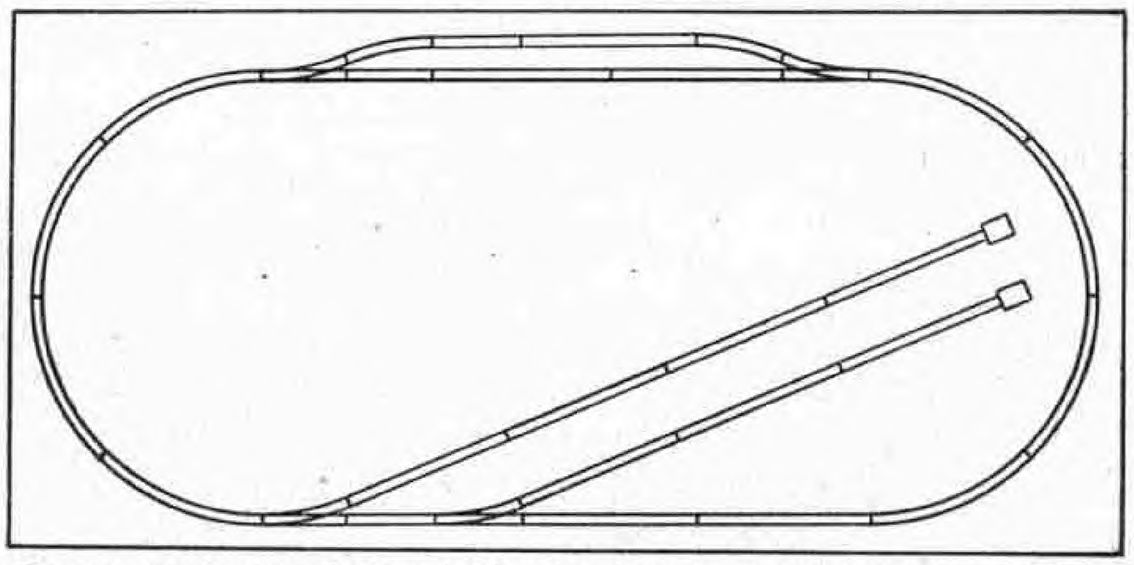


Diagram showing how the layout referred to is made up. The rails only are shown, as the positions of the accessories can be left to individual choice.

We will assume that at the commencement of operations our passenger train, consisting of a Two-Coach Articulated Unit, is standing alongside the terminal station platform, with the locomotive already attached. Similarly the goods train, consisting of an 0–6–2 Tank, two Wagons, two Vans and a Brake Van, is in the goods road alongside the Goods Depot previously referred to. The first train movement can be run by the express from the terminus to the passing station. If we give the locomotive 11 or 12 half-turns of the key, assuming that it is unwound at the start, we will find that it will leave the terminus and make three full circuits of the track. It can then be diverted into the loop road if this is served by a platform, or it can be run straight into a stop on the parallel track.

Possibly the locomotive will run a little too far. In that case the run should be made again, giving the motor from an unwound state a little less than the number of half-turns of the key given on the first run. For instance if 12 half-turns prove too much it is not a bad plan to count the "clicks" of the ratchet after the eleventh half-turn; if "11 and two clicks" is not enough, then an additional "click" on the next run will probably be just right. Judgment must be exercised as to the exact point at which to stop winding, but after a little experience it is not difficult to give just the right amount of "wind."

While the express is at rest we can wind up the locomotive of the goods train and despatch it for a trip round the main line. We must not forget to set the points at each end of the loop road, as one or other of the tracks is occupied by the passenger train. With about the same number of turns of the key as we gave the passenger locomotive, the goods train will run from the siding, make three circuits of the track, and finally come to rest on the loop. The goods train can now be left refuged while the passenger train proceeds on its way. This train can stop at the intermediate station after one, two or three circuits, the number of turns of the key being varied according to requirements.

It is now the turn of the passenger train to wait at the station. We can therefore despatch the goods train, but in order to avoid delay to the express we will imagine that the goods train is bound for the goods yard. If we wind the Tank Locomotive to the extent of two half-turns of the key and three "clicks" of the ratchet the train will run forward round the main line until it is just past the points leading to the goods road. On reversing it will be found that the locomotive still has sufficient energy to propel the train into the siding. The express can now be despatched as before. When it has reached the end of its run we can uncouple the Tank Locomotive from the wagons in the siding, and if we then give it just over two half-turns of the key it can be run round the track to couple on to the rear of the passenger train. After coupling up, the engine is reversed and then the express locomotive is reversed also. The two engines between them, without any further winding, will move the train out backward from alongside the platform round the main line until the points leading to the inner station are reached.

The Tank Locomotive can be used in this way, as it adds to the variety of operations, and it is not correct in any case even for empty passenger trains to be backed over considerable distances along the main line. The Tank Locomotive by now will probably be run down, but after being detached from the train the slightest amount of "wind" will be sufficient to carry the engine into the goods siding again. The passenger locomotive can then be made to back its train alongside the platform of the inner station once more in order to commence a further round of duty. For this purpose it is only necessary to turn the key for about three "clicks" of the ratchet.

The trains are now in the same positions as they were when we commenced operations. A great deal more variety is possible than the necessarily simple operations that have been described in this article. Individual Hornby-Dublo Train owners will all have their own favourite schemes and we should like to hear about them.

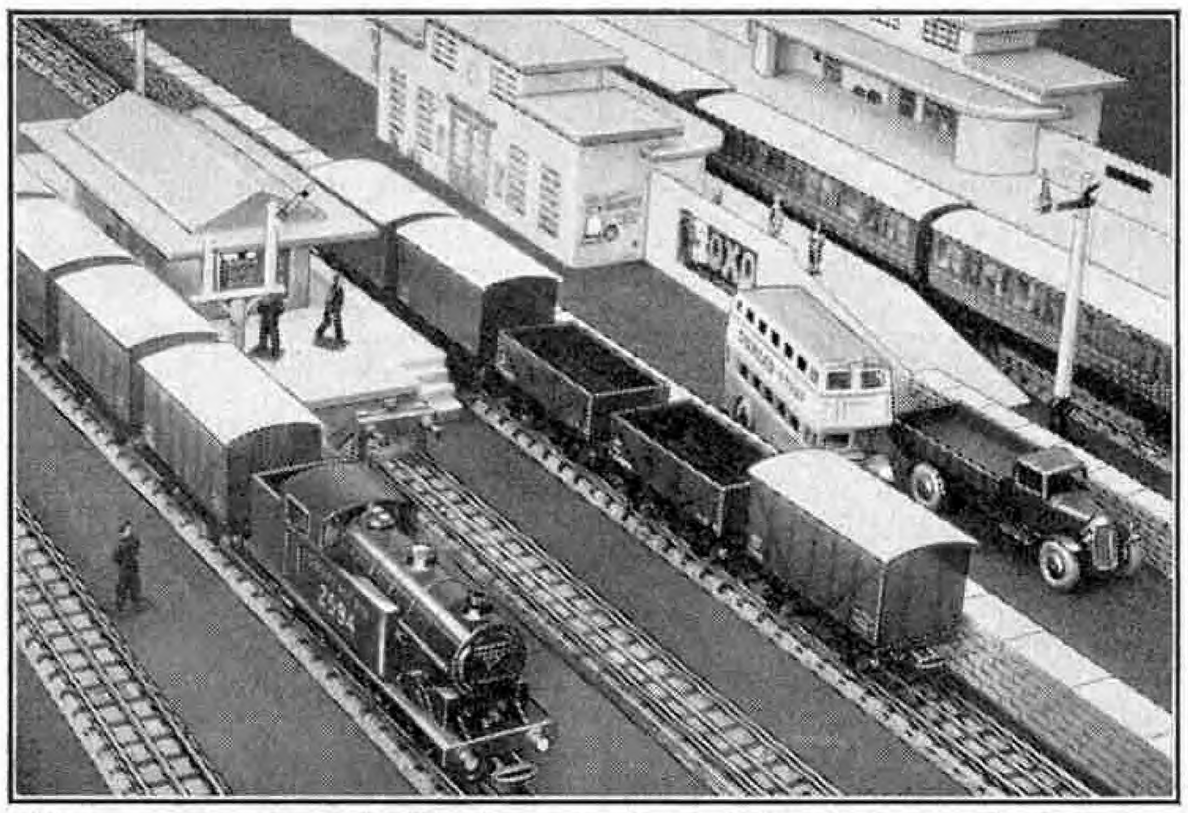
Building Up a Perfect Layout

How to Use Hornby-Dublo Accessories

ALTHOUGH the Hornby-Dublo Railway System has been available such a short time it has already been received with the greatest enthusiasm as the most perfect table railway in existence. Everything connected with it, from the most impressive streamlined locomotive to the smallest accessory, is built to scale besides being very attractive in appearance and perfect in workmanship. The essential items are already available, so that running operations to delight the heart of every model railway enthusiast can be carried on, and other rolling stock and accessories are to be added to make up a realistic and comprehensive system.

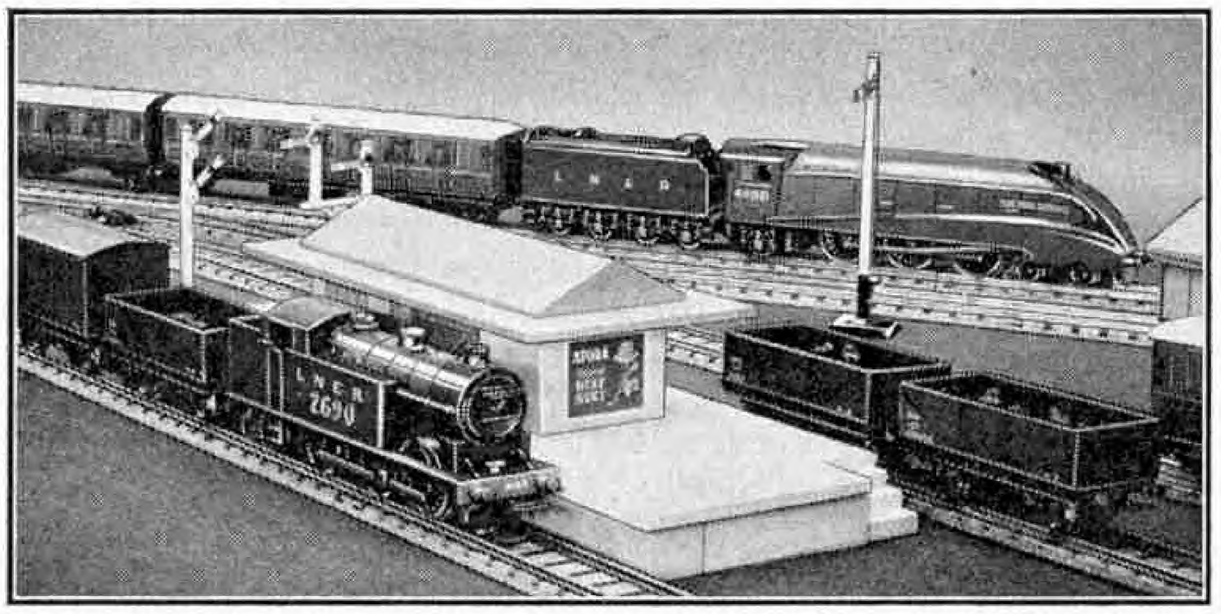
A miniature railway must have a complete set of accessories if it is to look real and to provide for proper operations. This has been kept in mind in planning the Hornby-Dublo railway, and exactly what is required is being provided. Probably the most important single accessory is a station. The Hornby-Dublo Main Line Station is made of wood and is splendidly built in fine modern style, with handsome station buildings and a flat roof. Its length is 24 in., so that it can accommodate a train of three coaches. Well-known national advertisements adorn its exterior, like that of a real station, and its appearance is further improved by the many details shown on it, including a futuristic clock face.

The owner of this station can choose one of four names for it to suit the particular railway on which his miniature line is modelled. These names are "Berwick," "Penrith," "Truro" and "Ashford," representing the L.N.E.R., L.M.S., G.W.R., and S.R. respectively, and they are provided on printed gummed slips ready to put in position. Whatever name is chosen, the Station fits splendidly into any Hornby-Dublo layout, to which it gives a workmanlike and up-to-date appearance, as the upper illustration on this page shows.



A busy scene on a Hornby-Dublo railway, showing the Main Line Station, the Goods Depot and Buffer Stops in suitable and realistic positions. The junction signals in the illustrations on this page are Dinky Toys.

The Hornby-Dublo Island Platform also is built of wood in similar style to the Main Line Station. It has an open shelter consisting of semi-circular ends supporting a flat roof, four back-to-back seats are provided, and replicas of well-known advertisements complete a very handsome structure. This Platform can be used separately between two tracks, or it can be employed very effectively in conjunction with the Main Line Station, to form a large station. Its length is the same as that of the Main Line Station.



The Hornby-Dublo Goods Depot with a train passing by it. This accessory can be placed between two tracks, as illustrated, or used alongside a single track.

Two other items in the range are made entirely of wood—the neat Signal Cabin and the useful Goods Depot. The Signal Cabin is a typical example of one of the medium-size cabins used in actual practice, and gummed slips printed with the names "Berwick," "Penrith," "Truro" and "Ashford" are provided with it so that it can be given the same name as the Main Line Station. The Cabin is as modern in style as the accessories already described. It has printed on it the wide windows invariably provided in the upper storey for the signalman, and there are also the lower windows and a door for the benefit of the maintenance staff.

The Goods Depot is 12 in. long, and no Hornby-Dublo goods yard would be complete without one. In it there is ample room for consignments of various kinds of goods, and steps are provided at each end so that the staff can pass from building to track and back again without difficulty. The Depot is decorated with interesting and realistic details, and the usual advertisements make it a most realistic accessory.

It is scarcely necessary to point out to Hornby-Dublo enthusiasts how important is the signalling of a system. The Hornby-Dublo Signals are all of the latest upper quadrant type, and include a single-arm "Home," a single-arm "Distant," and a combined "Home" and "Distant" Double-Arm Signal. They can be used to fulfil most model railway purposes, and other signals such as the junction type will follow eventually.

The present Hornby-Dublo Signals are 4⅜ in. high and their bases and posts are die-cast in one piece. The posts are realistically tapered and finished off with a smart cap at the top, giving them a very pleasing appearance; and the lamp case and bracket also are included in the casting. The counterweighted lever at the base of single arm "Home" and "Distant" Signals operates the arm, which is splendidly tinprinted in correct colours, red with a white band for "home" arms and yellow with a black band for "distants." Two levers are of course fitted to the Double Arm Signals. All these Signals work perfectly, the arms moving freely, yet stopping in the position to which they are set.

Buffer Stops are essentially track pieces, but for the purpose of this article they will be described under the heading of accessories. Those in the Hornby-Dublo System are particularly realistic models of a type seen on all railways. The base, upright portion, warning lamp and supports are die-cast in one piece, and the crossbeam and buffer stocks are a separate casting riveted in place. These models are grey, with red crossbeam and stocks. They are secured to the track by means of a special spring arrangement, which fits into slots provided at one end of the printed metal bases of the Hornby-Dublo Straight Rails, and they cannot become detached from the track when rolling stock comes in contact with them. It is important to note that the springs engage from inside.

The need for tunnels is met by two useful Hornby-Dublo Accessories in the D1 Short Tunnel and the D2 Long Tunnel. The smaller Tunnel can be used on both curved and straight track, but the larger one is suitable only for straight track. Both are built up and finished off in the popular style adopted for the well-known Gauge O Tunnels.

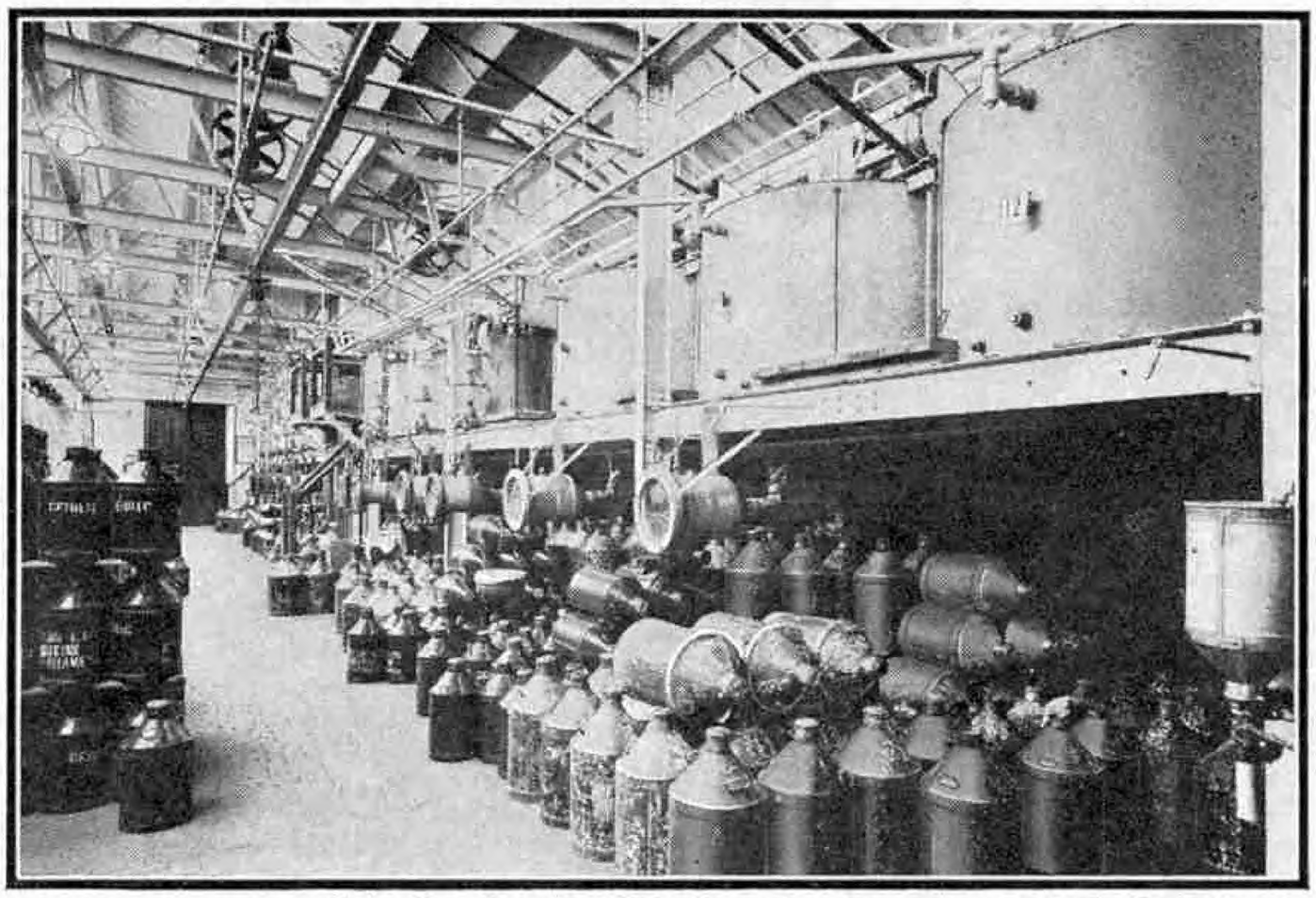
The remaining accessories of the Series are delightful miniature railway workers and passengers specially designed for the new system. These are exceptionally realistic models. The miniature Staff consists of six figures, a Driver, Porter, Ticket Collector, Stationmaster, Guard and Shunter. The interesting selection of Hornby-Dublo Passengers add life and realism to a station scene.

The Doping of Aircraft

Protecting Fabric Covering from the Weather

THE fabric covering of aircraft would suffer from the effects of damp, changes of temperature, and exposure to the sun for long periods if it were not protected in some manner, and from the early days of aviation the need for coating it with some special preparation or "dope" has been realised. This doping is particularly important in respect of the wings, as it plays a part in keeping their fabric taut and thus preserving their correct shape. Any variation in that shape would alter the lifting power of the wing, and this in turn might seriously affect the take-off and performance of the aeroplane.

At first such materials as sago were used for doping aircraft, but these proved ineffective in wet weather. Experiments were then carried out with casein solutions, but were practically discontinued when it was discovered that cellulose acetate dissolved in suitable solvents gave what were then considered excellent results. This substance had the advantage over the materials previously used of being comparatively unaffected by atmospheric conditions. The first cellulose acetate dope for aircraft was sold in this country in 1911, and its adoption was slow until the outbreak of the Great War, when its use was greatly extended.



General view of one of the Mixing Shops in which "Cellon" aeroplane dopes are prepared. The illustrations to this article are by courtesy of Cellon Ltd., Kingston-on-Thames.

Until 1916 the doping of aircraft consisted simply of applying six successive coatings of clear cellulose acetate dope to the fabric. This method gave excellent results in rendering the fabric taut, but it was found that owing to the action of ultra-violet light the life of both the dope and the fabric was not very long. To overcome this difficulty a pigmented covering, consisting of a nitrocellulose base containing colours ground in castor oil, was applied over the clear dope. Nitrocellulose is a fluffy product not unlike cotton wool in appearance, and is made by acting on cotton or similar material with nitric and sulphuric acids. It is highly inflammable.

The most general colour used was khaki for the wings, etc., and red, white and blue nitrocellulose varnishes were introduced for the identification colours. Towards the end of the War it was found that the khaki used for dope covering had two serious faults. Owing to its dark colour aeroplanes treated with it were very easily seen when in the air, and this particular colour absorbed heat rays, with the result that the temperature in the interior of the wings became higher than was desirable. To overcome both these faults a nitro dope covering pigmented with aluminium powder was used. This covering reflected the heat rays satisfactorily, but it was found that it did not entirely eliminate the ultra-violet rays. A doping scheme therefore was evolved that consisted of four coats of clear acetate dope, followed by one of a nitro dope coloured with red iron oxide, and a final coating of aluminium dope. The object of the red iron oxide dope was to absorb any ultra-violet light that passed through the outer coat.

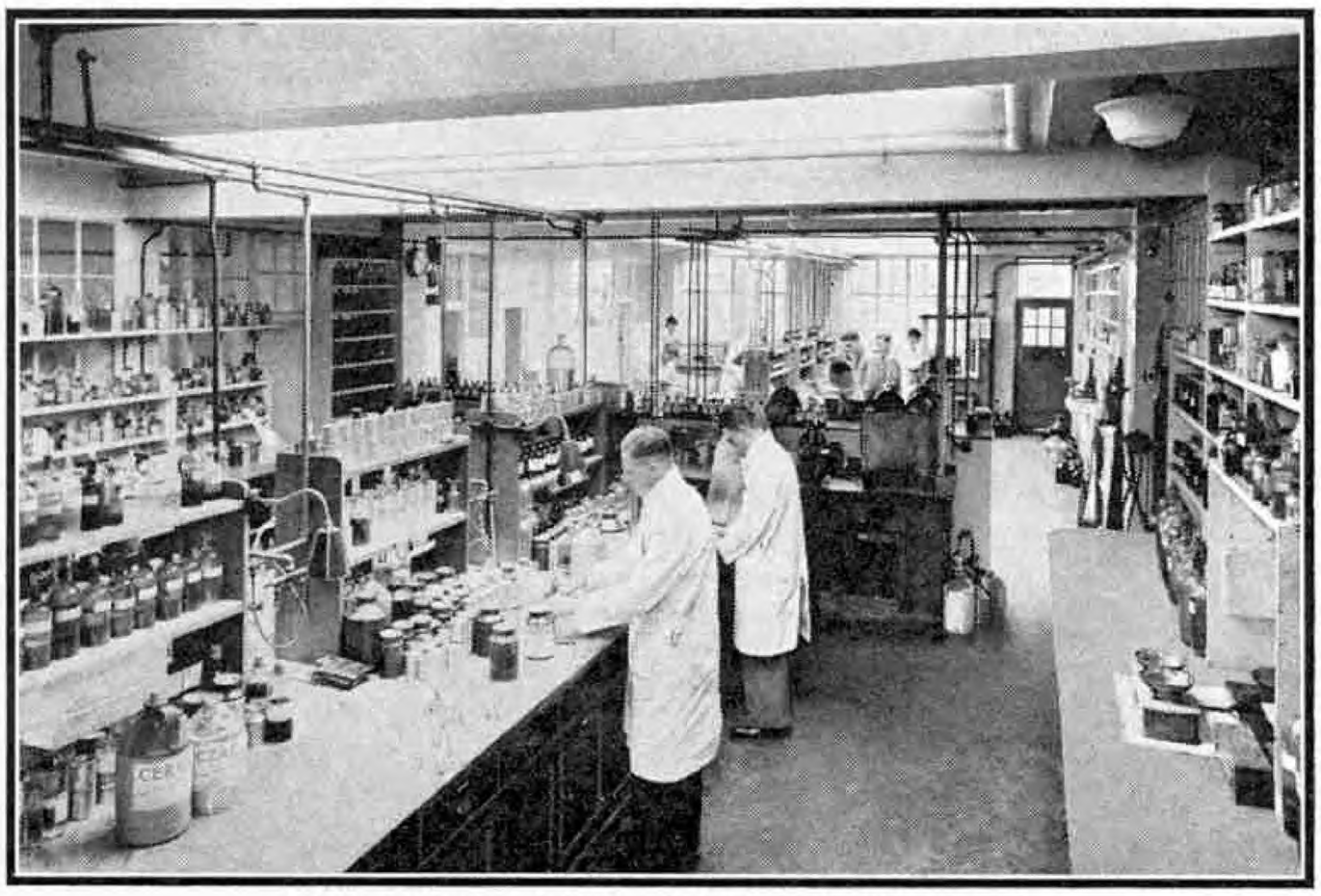
The only objection to this scheme was that the number of coatings employed was rather high, and added unnecessarily to the weight. The next development therefore was to eliminate the red iron oxide dope covering by pigmenting the acetate dope itself, and the number of coatings necessary was still further reduced by applying two coats of pigmented acetate dope followed by two coats of aluminium acetate dope, both materials having tautening properties. This scheme proved to be exceptionally economical and gave excellent durability, but as the dope was cellulose acetate throughout it was susceptible to changes in the humidity of the atmosphere. In consequence the tautness of fabric covering treated with it was reduced when the atmosphere was moist.

Doping schemes consisting entirely of nitrocellulose, however, were not affected by humidity in the same way, and remained taut under all conditions. Dopes of this type have become very popular, and they are now used practically to the exclusion of all other types, especially as the disadvantage of this type in being highly inflammable need no longer be considered, as the flame is blown out by a wind of 20 m.p.h., which is far below the flying speed of an aeroplane. The present-day doping schemes, therefore, consist of applying two coats of nitro dope pigmented with red iron oxide, and following this by two coats of nitro dope pigmented with aluminium powder or any other suitable colouring material.

The nitrocellulose used in making these dopes has to be of good quality nitro cotton, and the solvents used are the usual lacquer ones, such as acetone, benzole, and toluole. In manufacturing the dope the nitrocellulose is first dissolved in a mixture of solvents, in large mixers of 500 to 600 gall. capacity fitted with mechanical stirring or agitating gear. The pigment is ground to the required

extent, either in ball or pebble mills in the clear dope, or on roller mills in the oils or plasticisers required. The effect of these is to prevent the dope covering from cracking after long periods of exposure.

The ball type of mill consists of a cylindrical barrel that is slowly revolved and contains a number of steel or granite balls, which by their weight revolve at the base of the barrel. The pigment is broken up by contact with these pebbles until it is extremely finely divided. During its running the ball mill is entirely sealed so that no loss of volatile solvents can occur. The roller mill may consist of two or three steel or granite cylinders pressed against each other and revolved at different speeds, so that a thin film of the pigment paste is taken from one roller to the next, and is finally removed by a scraper bar.

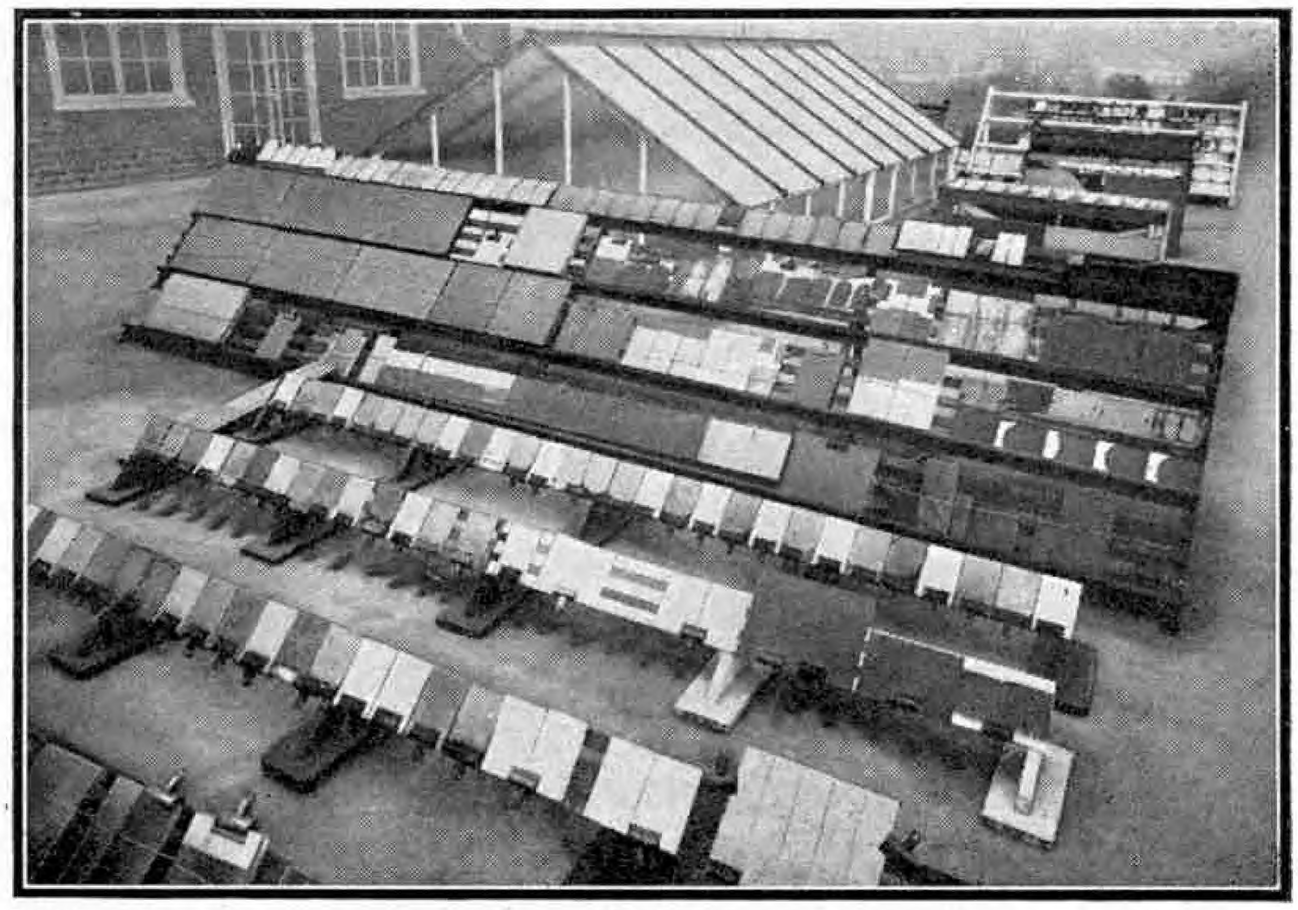


Testing raw materials in the laboratory at the Cellon factory.

The dispersed pigment is then added to the nitrocellulose solution, and the mixing is continued until the pigmented dope is uniformly mixed. The dope is then tested in regard to consistency, the tautness produced on fabric, brushing or spraying properties, and other characteristics, to ensure uniformity and to maintain a standardised product.

The finished dope has a paint-like appearance, but owing to the more volatile solvents employed in its composition, it dries very much more quickly than ordinary oil paint.

In the average dope shop of the aircraft factory, the "bag" of fabric, previously cut to shape and sewn up, is pulled on to the wings and fuselage, and the first coat of red dope is rubbed well into the pores of the fabric by means of large brushes. This coating is given an hour to dry off and to tauten the fabric, when the tapes or strips of fabric are applied over seams and usually over ribs, etc., and are stuck down by means of a further application of dope. Further applications of dope are usually carried out by means of the spray gun, whereby it is atomised with compressed air at a pressure of approximately 50 lb. to the square inch. Such application is very much quicker than by brush, but it is necessary to apply the first coat by brush in order to obtain the necessary penetration and adherence to the fabric. The dope is usually passed to the spray gun through pipe lines under low pressure, so that in the case of a large machine workmen can apply it simply and efficiently from suitable scaffolding without the inconvenience of handling containers.



Samples of aeroplane dopes, and lacquer, undergoing exposure tests on the roof of the laboratory.

The final operation consists of painting, through stencils, the red, white and blue discs, identification letters and other markings. The aircraft is then ready for the air.

In the early days, when doping was carried out in anything but heated or air-conditioned dope "shops," a trouble known as "chilling" was experienced. Instead of drying normally, the dope film dried out either patchy or completely white, owing to the precipitation of the nitrocellulose in the dope by tiny drops of moisture formed on the surface of the wet film. This moisture is caused by rapid evaporation on the surface, which causes a lowering of the temperature below that at which moisture in the atmosphere is deposited in the form of dew.

In recent years the aircraft industry has grown very rapidly, and many instances have occurred of aeroplanes having to be doped in places lacking a heated dope shop. Dopes therefore were evolved that could be applied in almost any atmospheric conditions, and to-day dopes are available that can be applied satisfactorily in the open air.

The increase in the use of metal on aircraft has necessitated much attention being paid to its protection. Shortly after the Great War cellulose lacquers were very popular for this purpose, but during recent years the newer type of synthetic lacquers have become very prominent. This type of lacquer is exceptionally durable on metal, and also gives excellent durability on three-ply. It has the advantage, from the aircraft point of view, of not adding to the weight per square yard as the ordinary oil variety formerly did. Synthetic finishes are at present largely used on all-metal Service aircraft to produce the non-reflecting camouflage colour schemes. In these the upper surfaces are shaded in large irregularly shaped patches of dark green and dark brown, and the under surfaces are dull black.

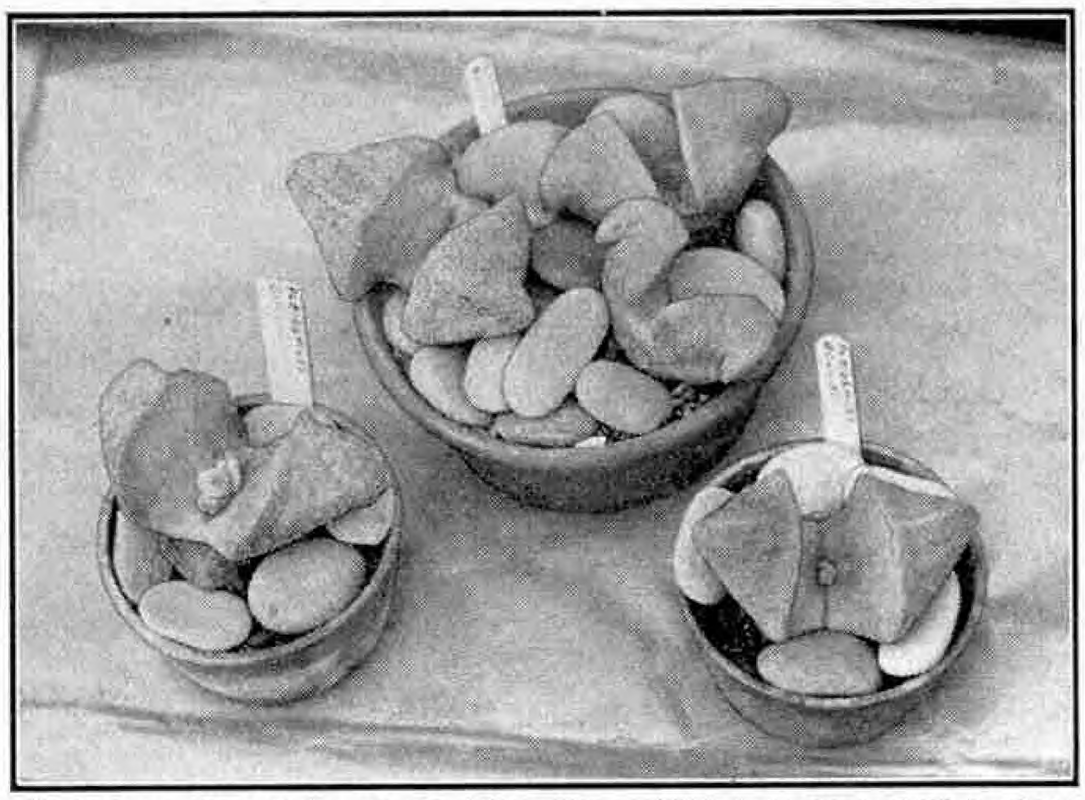
Cactus Wonders

Plants that Disguise Themselves as Stones

By G. Bernard Wood

AN odd assortment of cactus plants is rapidly becoming a popular feature of the ordinary man's greenhouse, and sometimes these curious growths are displayed on a window sill, or used as table decorations. As yet few English people know very much about them, however. The hobby is too young. Yet the native uses of cactus plants, and the folklore that has been woven around them, make a story that is full of strange interest.

It may be surprising to learn that several varieties of cactus have a distinct food value. The Fireball Cactus of South California is a good example. This magnificent plant grows to a height of 10 ft. and has a great mass of flaming spines that give the appearance of a fireball. Its flowers are yellow and orange, but the natives make a harvest of the unopened buds, cooking these in grease and eating them as a vegetable.



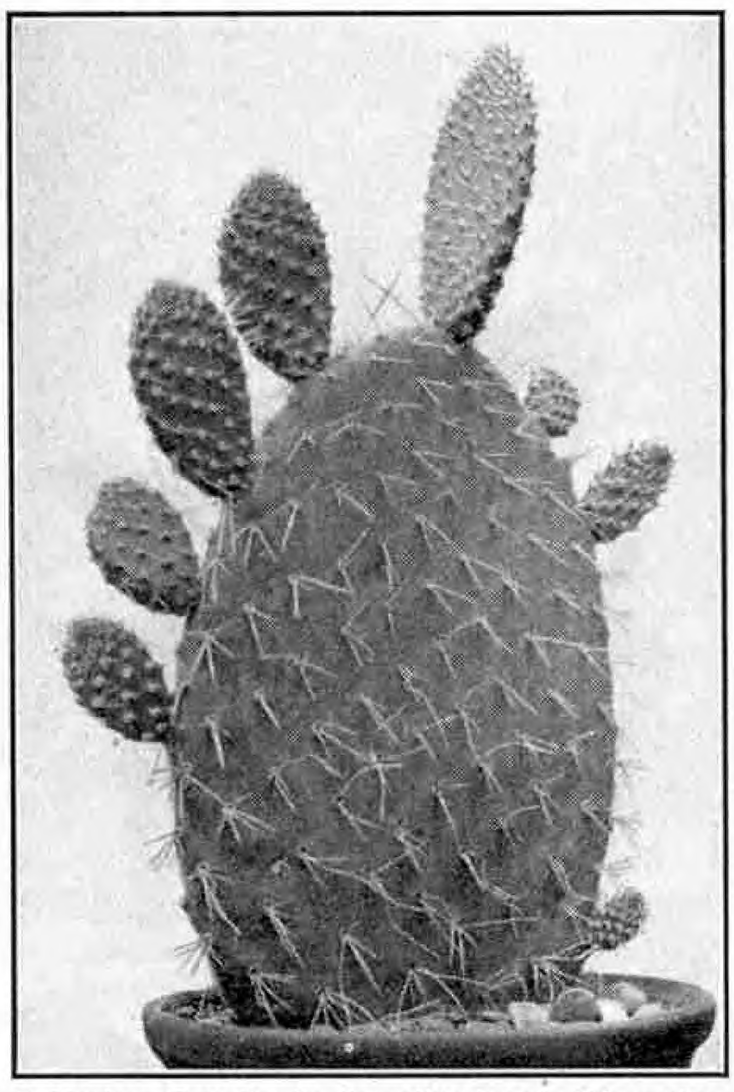
"Living stone" cacti from South Africa. The mottled appearance of this curious plant has deceived even experienced cactus collectors.

The Pebble Cactus of South Africa is so named because among the surrounding pebble shale it goes almost unnoticed, but not by the children, who search diligently for the tiny plant and eat it as a sweetmeat. Another South African species that adopts a camouflage is the Living Stone, a name coined for it by the natives because its masquerade as a stone with a mottled surface is sufficient to deceive anybody. For years experienced cactus collectors, when their quest had led them to this country, passed these "stones" by or sat among them without suspecting their true nature!

There is no such deception about the Opuntia group of plants. Huge oval-shaped "branches" equipped at intervals with sharp spines are their characteristic feature. They were used to great advantage by soldiers stationed in some parts of Asia during the Great War, being planted as hedges to keep off marauding tribes and also to corral mules. The Opuntia is perhaps the most familiar type of cactus to English people, and is the last one would expect to have any food value. In their native areas certain kinds are used as forage and vegetables, however, and also are essential ingredients of salads and candy. Cheese and meal for human consumption are other products it yields. A good character must therefore be credited to several cactus plants, in spite of appearances, but the family has several "black sheep." For instance, with its stick-like stems punctuated by notches the Stapelia looks harmless enough, yet it is poisonous. African witch-doctors know its real nature! Formerly, if they wished to "get rid" of anybody they took a slice off the Stapelia stalk and secretly dropped it into the offender's soup.

Another variety flourishing in Mexico and South Texas contains a very powerful drug, which has such an effect on the optic nerve that it makes those who taste it become strangely exhilarated and see highly-coloured visions. To-day the use of this drug is prohibited in Mexico.

Some cacti are looked upon as demi-gods and may only be touched by priests, who must first wash their hands, while other varieties have medicinal properties known only to the natives. The strangest stories of all are told about the Lophophora cactus. One of its attributes is the power to protect a man. For example, it is believed that a bear cannot attack a man who carries one of these plants in his belt while out hunting. The same talisman renders the deer an easy prey for the hunter.



A Mexican Opuntia. In its native haunts this cactus grows to a height of 8 ft. to 10 ft.

The plant certainly has a peculiar hold on the people's imagination, for on seeing it Christian natives always make the sign of the Cross, while others honour it with a salute. The reason given for this deference is that the plant speaks to them! The Tarrahumare Indians go further, declaring that for them the Lophophora sings, making their long expeditions in search of it comparatively easy, for the soft though insistent music, like the voice of some earthbound Ariel, leads them on to its remote and hallowed haunts.

The Lophophora, therefore, would seem to be a most desirable plant to have in one's collection; as a spectacle of awe it would even eclipse those now-familiar cacti, the "Christ-thorn" and the white-bearded "Old Man."

Aircraft in the Dinky Toys Series

New Air Liners and Bombers

READERS of the *"M.M."* have always been interested in aircraft, and during the past year or two this interest has become more and more keen. There is good reason for this. For the rapidly growing Royal Air Force magnificent machines have been designed to make Great Britain and the Empire secure against attack, and all the great nations of the world are eagerly developing their fleets of commercial aircraft.

It is good to read descriptions of these machines and to see photographs of them in the newspapers, but it is better still to have small models of them that can be handled and examined and compared. Miniatures of this kind are of little use, however, unless they are designed to scale, with the typical features of each one reproduced with the greatest possible accuracy. The models that are rapidly being added to the famous Meccano Dinky Toys Series are unique in this respect. From photographs and dimensional details supplied by the builders of the most famous aircraft, the Meccano draughtsmen prepare scale drawings from which skilled toolmakers produce dies of marvellous accuracy. By means of these dies specially designed machines in the great Meccano Factory produce in enormous numbers the perfect die-cast miniatures that are now being collected so enthusiastically in all parts of the world.



Airspeed "Envoy" Monoplane. Dinky Toys No. 62m.

In the home of almost every Meccano boy these models are to be seen on mantelpiece, sideboard or table. Many boys have constructed for their models a reproduction of an airport, complete with the usual typical buildings; and when displayed on such an aerodrome the miniatures look extraordinarily realistic. Other boys have made for themselves, or had made for them by the local joiner, a wooden case with an opening glass front, large enough to house a considerable fleet of the Dinky Toys models, in full view and ready for removal for examination at any time.



Armstrong Whitworth "Ensign" Air Liner. Dinky Toys No. 62p.

Nearly fifty different aircraft are already included in the Dinky Toys Series, and many others are in preparation and will be on sale very soon.

Among the most popular commercial machines in the Series are the Empire Flying Boats (Dinky Toys No. 60r) that are now operating on the Imperial Airways routes to Africa, India and Australia. Twelve models of these aircraft are available, including *"Caledonia"* and *"Cambria,"* which, before commencing operation on the normal Empire air services, achieved fame in the experimental flights across the North Atlantic carried out in 1937 by Imperial Airways and Pan American Airways. *"Caledonia"* made the first of the flights, on 5th July, 1937, crossing from Foynes on the River Shannon, Eire, to Botwood, in Newfoundland, and covering the 1,993 miles in 15 hr. 3 min. The fastest 1937 crossings were made by *"Cambria,"* westward in 14 hr. 24 min., on 26th August, and eastward in 10 hr. 36 min. on 27th–28th September.



Armstrong Whitworth "Whitley" Bomber. Dinky Toys No. 60v.

For Pan American Airways the flying boat *"Clipper III"* made several crossings of the Atlantic, and there is a striking Dinky Toys model of this huge aircraft (Dinky Toys No. 60w). In view of their splendid transatlantic achievements it is very interesting to compare the models of *"Cambria"* and *"Caledonia,"* and of *"Clipper III."* Both the British and the American machines are of the four-engined high-wing monoplane type, and yet they are strikingly different in appearance.

In the forefront of the giant landplanes of the world is *"Ensign,"* the first of a fleet of four-engined monoplane liners to be put into service by Imperial Airways. These aircraft, which are the largest of their kind so far produced in this country, will be known as the "Ensign" or "E" class. The Dinky Toys model of *"Ensign"* (Dinky Toys No. 62p) is, if possible, even more realistic than the models of the Empire Flying Boats. Models of several other members of the "Ensign" class will be available shortly. These aircraft are of two types, one for service on Empire air routes, to carry 27 passengers, and 1¾ tons of mail and freight; and the other for European air service, with seating for 40 passengers. They will each have four Armstrong Siddeley "Tiger" engines developing a total of 3,200 b.h.p., giving a cruising speed of nearly three miles a minute.

Among German air liners, pride of place must be given to the Junkers Ju 90 type. These are most impressive-looking giants, and no reader should miss the fine scale model (Dinky Toys No. 62n) that has recently been produced. The Ju 90 is a four-engined low-wing monoplane designed for heavy load carrying rather than for the attainment of extremely high speeds, although when equipped with Junkers "Jumo 211" engines it can attain 256 m.p.h. It has five cabins, providing seating accommodation for a total of 40 passengers.

Among lighter commercial aeroplanes a British type that has proved very successful is the Airspeed "Envoy," and machines of this type are in service in France, Australia, and elsewhere. It is a neat twin-engined low wing monoplane, and the Dinky Toys miniature (Dinky Toys No. 62m) gives an excellent impression of its attractive appearance. An Airspeed "Envoy" was acquired last year by the Air Council for the King's Flight, and in the Dinky Toys Series there is a fine model of this particular machine (Dinky Toys No. 62k), bearing the proper registration letters and finished in the correct colours. The King's aeroplane differs from the standard "Envoy" only in regard to its internal equipment, and has already been used several times by His Majesty for flights to R.A.F. stations in connection with tours of inspection. It is fitted with two Armstrong Siddeley "Cheetah IX" engines giving a top speed of 203 m.p.h., and has accommodation for four passengers, pilot, radio operator, and steward. It is flown by Wing Commander E. H. Fielden, Captain of the King's Flight.

Among Royal Air Force machines in the Dinky Toys Series are the Fairey "Battle," Gloster "Gladiator," and Short "Singapore" flying boat. The Fairey "Battle" (No. 60n), one of the first modern monoplane types introduced into the Royal Air Force, is a single-engined bomber, with retractable undercarriage, and can carry a crew of three. The Gloster "Gladiator" biplane (No. 60p) is a fighter machine, heavily armed, and carrying four guns. The Short "Singapore" flying boat (No. 60h) is a sort of general purpose machine, used for long-distance reconnaissance, patrol, and sometimes bombing operations. It is a four-engined biplane.

The latest addition to the series is a magnificent model of the Armstrong Whitworth "Whitley" twin-engined heavy bomber (Dinky Toys No. 60v). This model accurately reproduces the severe design of the prototype, and conveys an impression of the grim purpose for which aircraft of this type are intended. The "Whitley" is a middle wing aeroplane of metal construction, and is fitted with an undercarriage that can be drawn up when the aeroplane is in flight. A heavy load of bombs can be carried, and there are also three enclosed gun turrets.

Two interesting sets of French aircraft have recently been introduced (Dinky Toys Nos. 60z and 61z). The first of these includes the famous triple-engined monoplane *"Arc-en-Ciel,"* and both sets contain current types of French military and civil aircraft.



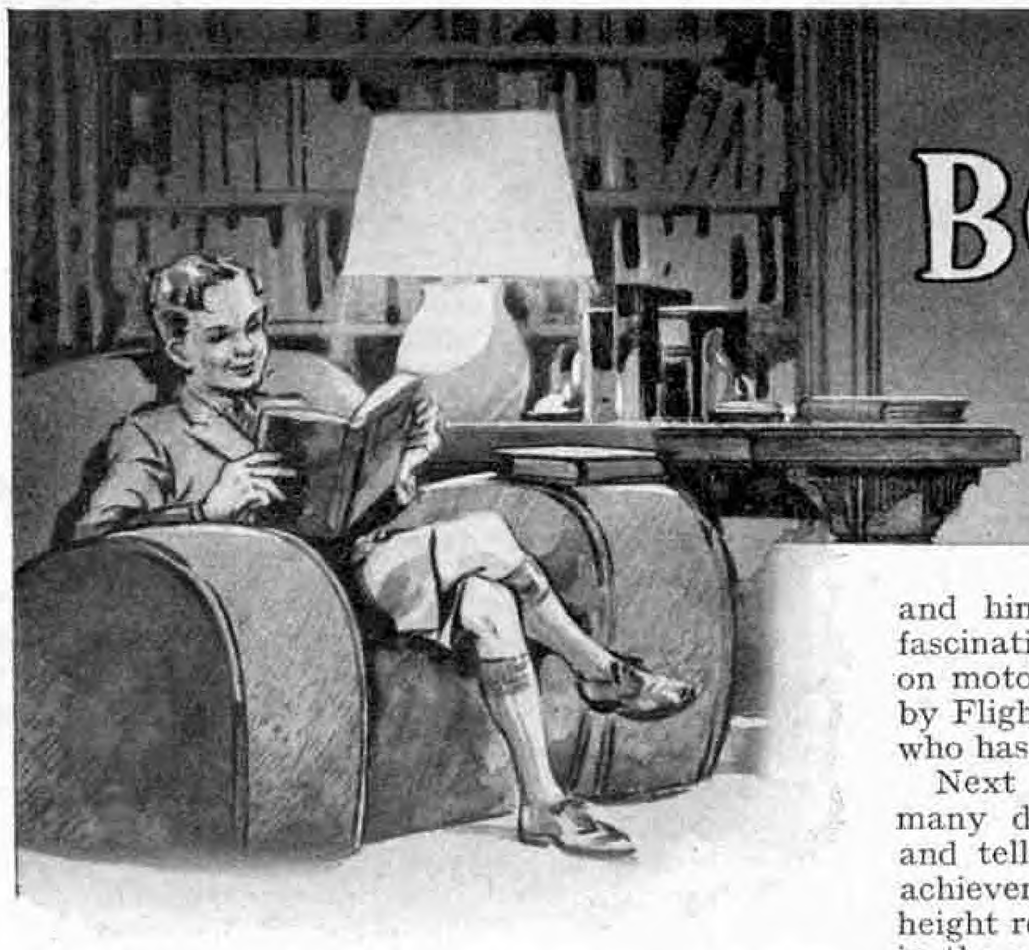
Junkers Ju 90 Air Liner. Dinky Toys No. 62n.



Imperial Airways Empire Flying Boat. Dinky Toys No. 60r.



Pan American Airways Flying Boat "Clipper III." Dinky Toys No. 60w.



BOOKS to READ

Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/- for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

"Power and Speed"

Edited by F. E. Dean. (Temple Press Ltd. 8/6 net)

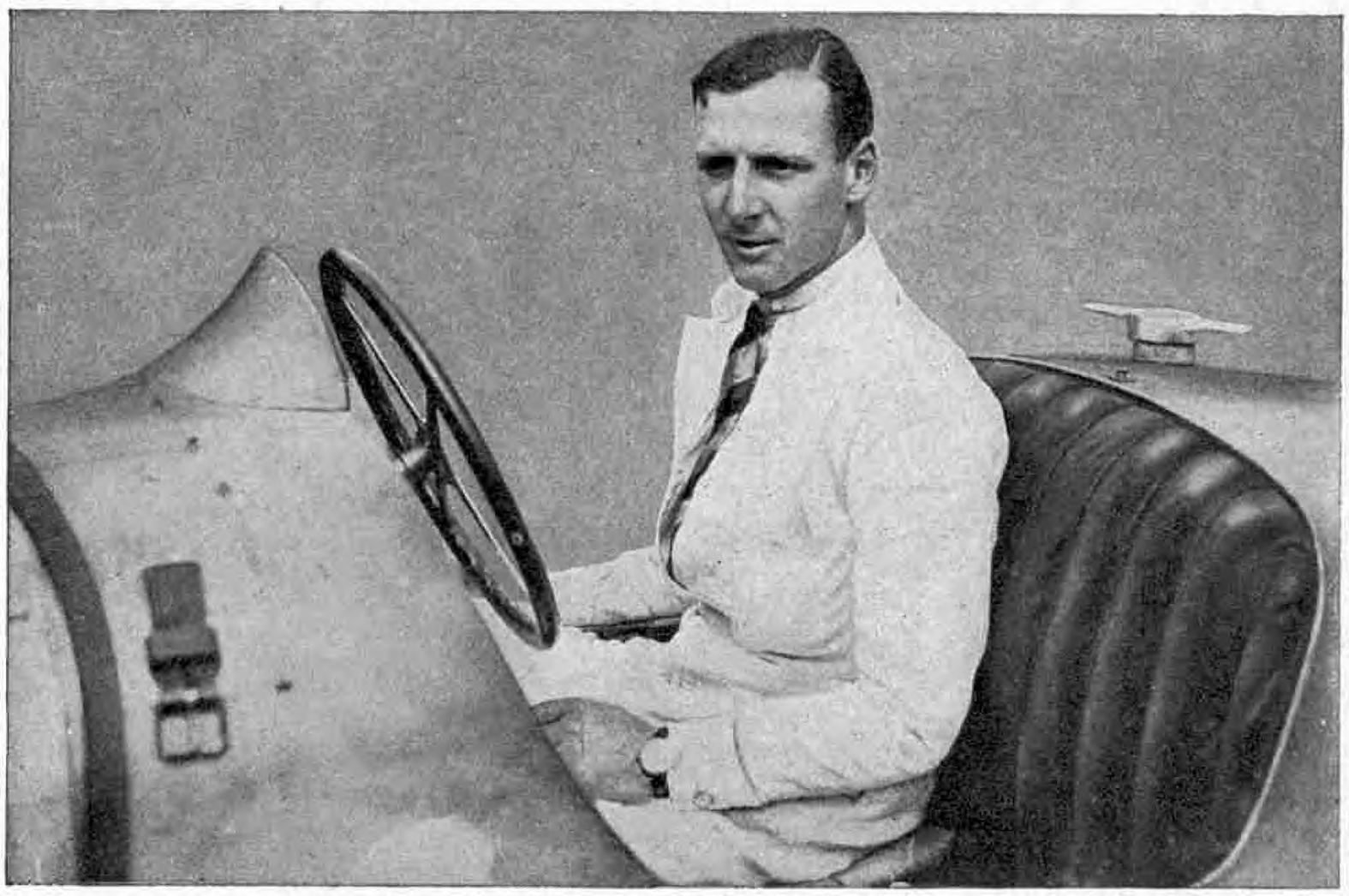
Here is a magnificent book in which every boy will revel. It deals with the story of the internal combustion engine on land, at sea and in the air, covering the subject so completely, and with such a wealth of splendid illustrations of motor cars, aeroplanes, trains and ships, that it will provide absorbing reading of which its possessor will never tire. It has been issued for the benefit of boys and young men, but it will prove no less interesting to motorists and others who wish to know something of the wonderful developments of speed and power in recent years.

It is impossible to give a complete survey of the contents of this remarkable volume, as it is so full of valuable material. It begins with an introduction telling the story of the invention of the internal combustion engine, and a short but effective explanation of the working of the petrol engine. Then we turn to motor cars, and in successive chapters read of the men who have striven to set up the world's land speed record, of racing cars for track and road, hill-climbing feats and record-breaking efforts of all kinds. Every chapter is written by a specialist with real knowledge and experience. Thus a thrilling description of a ride in the Senior T.T. Race in the Isle of Man is contributed by Graham Walker, Editor of *"Motor Cycling"* and himself a T.T. winner; and a fascinating chapter on speed work on motor cycles, cars and aeroplanes by Flight Lieutenant C. S. Staniland, who has achieved fame with all three.

Next comes a section describing many different types of aeroplanes and telling the stories of such great achievements as the creation of the height record. Every reader will revel in the authentic accounts here given of the speedy fighters, powerful bombers and other aircraft of the Royal Air Force, and of equally attractive air liners and other aeroplanes. Then we come back to the road to survey commercial cars of every possible kind, including special equipment for A.R.P. work, tanks and other Army vehicles, and the great motor buses that cross deserts in Africa and the Near East.

Thrills on land and in the air are followed by others on water. We read Sir Malcolm Campbell's own story of his successful efforts with his *"Bluebird"* to capture the water speed record, and other chapters deal with motor boats of all kinds, including the fast motor craft of the Royal Navy, and the R.A.F. Finally we come to the oil engine, the most recent development of the internal combustion engine, and learn how it has been put to use in driving ships and trains.

The book is a large one of 250 pages measuring 11 in. by 8 in., and contains more than 400 illustrations, with 10 large folding pull-outs.



Flt. Lt. C. S. Staniland at the wheel of a Bugatti racing car. This famous driver is also an aeroplane test pilot and a racing motor cyclist. From "Power and Speed," reviewed on this page.

"Animal Heroes"

By Harper Cory. (Duckworth. 3/6 net)

Stories of animals in their native haunts are always attractive, especially when they combine an exciting yarn of rivalry or combat with a picturesque but faithful record of wild life. Mr. Cory has done this in these attractive stories of three Canadian animals, *"Silvertip"* the faithful grizzly bear, *"Loppity"* the snowshoe rabbit, and *"Flagtail"* the buck deer. It will be seen that there is wide variety, and every reader will rejoice in following the three to victory over others of their own kind, and over man himself, for it is not always man who comes off best in his encounters with wild animals, as *"Silvertip"* shows. While still a cub he is adopted by an old Indian, and on his friend's death he outwits a dealer who is anxious to introduce him to a circus in which to show off the tricks the Indian has taught him.

"Loppity" is a different kind of hero, or rather heroine; she makes use of cunning instead of strength to avoid the dangers always pursuing her. Lastly comes *"Flagtail"* full of manly courage, whose chief dangers come from hunters and from rival bucks. An excellent series of animal drawings adds greatly to the attractions of the book.

"Cornet O'Dare"

By Major Charles Gilson ("The Boys Own Paper" Office. 2/6 net)

The hero of the tales in this book is an officer of Wellington's army in Spain, a fine horseman of dare-devil courage and unlimited resource. He is always leading his men into danger, but never fails to extricate them with considerable credit to himself and profit to the British Army. He beards Napoleon's marshals, strikes enemy guns, cuts off convoys and puts an end to the nefarious activities of spies with gay abandon, but at the same time with marvellous efficiency. He is fully alive to his own merits, and has an excellent foil in Sergeant Drought, who groans when some amazing exploit is attempted, but faithfully backs up his officer, and every reader will thoroughly enjoy their adventures.

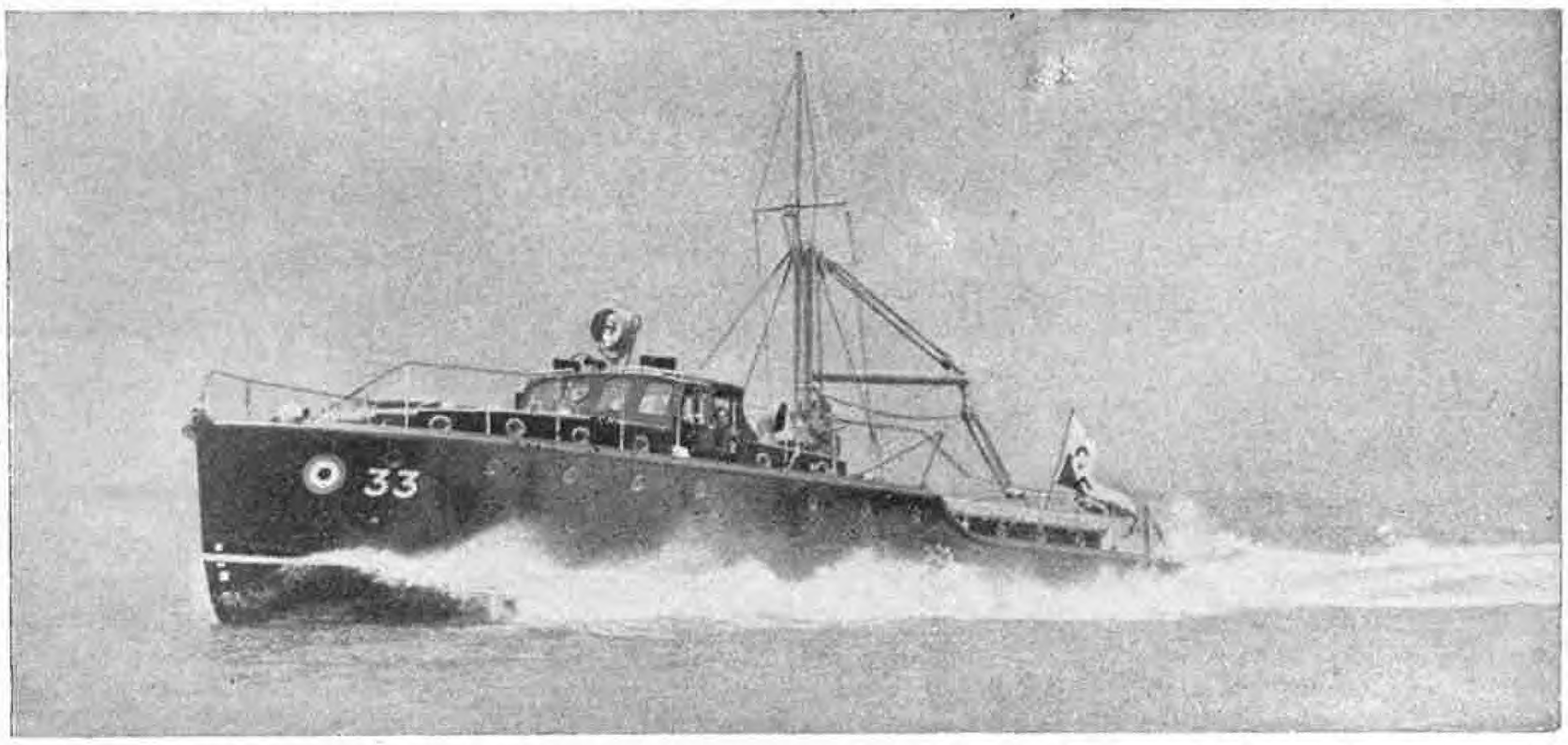
"Boys' Book of Bridges"

By CHARLES BOFF. (Routledge. 6/- net)

This is a companion volume to Mr. Boff's books dealing with the sea, flying and tunnels, which have previously been reviewed in the *"M.M."* Mr. Boff writes well of the many striking achievements that form his subject, and gives his readers a very good idea of the variety of structures that engineers have provided for crossing streams, rivers and even large estuaries, and of the boldness and ingenuity of their methods.

The story begins well with record-breaking bridges, such as that across Sydney Harbour and other great steel arches. Then follows an account of the building of the Storstrom Bridge, the longest in Europe, after which we turn to great suspension bridges, bridges without decks, the two remarkable bridges across the Firth of Forth and trestle bridges. And so we go on to the achievements of the pioneers who blazed the way for later bridge builders, to bridges with swing and lift spans and others that carry water. Mr. Boff is not content to describe all these structures, but also explains how they are maintained and repaired. He has a special chapter dealing with bridge disasters. It may seem strange to include this in a book devoted to the triumphs of the engineer, but it is well that his readers should realise how even from tragedies the engineer has learned the most valuable lessons.

There are 32 excellent full page plates.



A 60-ft. R.A.F. torpedo-carrying pinnace at full speed. These vessels carry torpedoes to seaplanes or flying boats. From "Power and Speed," reviewed on the opposite page. Photograph reproduced by courtesy of Messrs. Groves and Gutteridge, Cowes.

"The Boy's Own Annual"

("The Boys Own Paper" Office. 10/6 net)

The 60th volume of this old favourite fully maintains its interest and variety for boys of all ages. It contains the usual splendid serials and short stories, all by well-known authors, and there is wide variety of other attractions, including stamp articles, nature notes, contributions dealing with aeroplanes, ships and locomotives, and yarns on camping and sports. There are also many useful constructional articles that will be welcomed by boys who enjoy making things. The volume is full of splendid illustrations to both articles and stories, as well as humorous drawings, and is excellent value well suited to the modern boy.

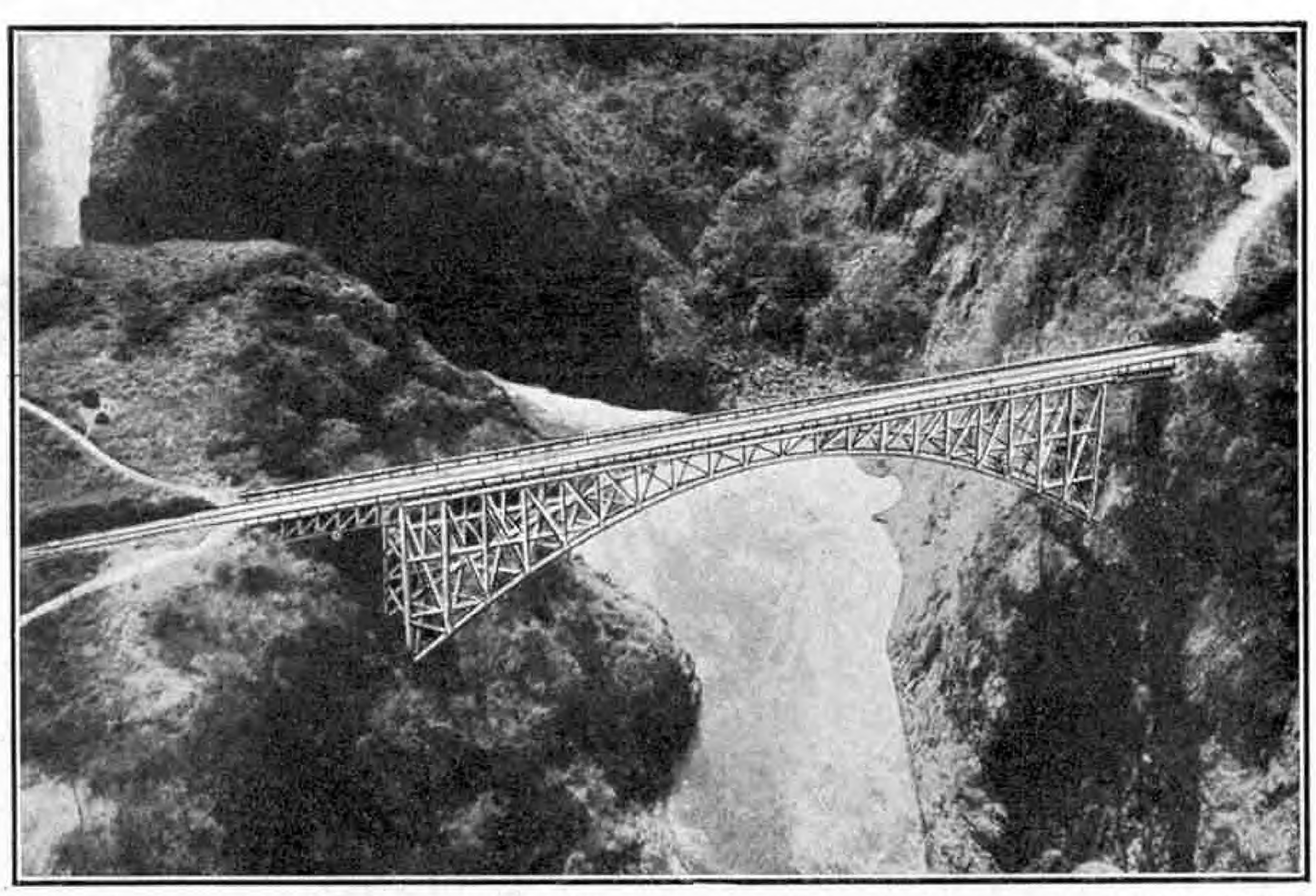
"Dickon Among the Lenape Indians"

By M. R. HARRINGTON. (Bell. 7/6 net)

Mr. Harrington has written an entirely different Red Indian story from the usual type, combining fighting and exciting adventure with an accurate picture of Red Indian life when white settlers were few.

Dickon is an English boy from a ship wrecked on the American coast while sailing to Virginia in 1612. He is found by Lenape Indians, who take him to their village on the Delaware River, where he works as a household drudge, kicked and beaten by his unpleasant owner and her son, until he turns on the latter and gives him a terrible thrashing. This leads to his purchase by a more friendly Indian, and eventually he is adopted and becomes a regular brave. There is an exciting raid by a hostile tribe, followed by a pursuit and the rescue of prisoners, in all of which Dickon plays a prominent part, and then, just at the moment when he has earned the respect and gratitude of the Indians, he is claimed by men from an English ship that sails up the river in search of the captive.

This intensely interesting tale of Indian life is illustrated by over 100 drawings.



Victoria Falls rail and road bridge, which is 400 ft. above high water level and has a centre span 500 ft. long. It is described and illustrated in "Boys' Book of Bridges," reviewed on this page.

"Heroes of Forgotten Adventure"

By T. C. BRIDGES. (Harrap. 7/6 net)

In spite of the enormous number of books of adventure and exploration that have appeared it is easy to find other pioneers of travel and men in search of fame and fortune, or merely of knowledge, of whom fine stories can be written. Mr. Bridges has done this in his new book, which is similar to his "Heroes of Modern Adventure" series. The adventures of the men whose tales he now tells are no less exciting than those of the better known explorers who figured in his earlier books. They are described vividly and accurately, so that readers appreciate the dangers the men encountered from savages and wild animals, and from lack of food and other necessities.

Among Mr. Bridges' heroes are such men as Speke, who discovered the source of the Nile, Stuart, Burke and other explorers of the parched wildernesses of Central Australia, and Edward Whymper, whose pioneer ascent of the Matterhorn is described. Then there are such men as Cochrane, the British ex-officer who one day set out to walk half-way round the world, and actually marched through France, Germany, Russia and Siberia to the Pacific Coast. With the author we also accompany Waterton and Hesketh Prichard, two famous naturalists, in their travels through South America, and sail round the world in a 36-ft. boat with Joshua Slocum. These and other stories make up a book that is packed with real interest and variety.

There are 16 full-page half-tone illustrations.

"The Schoolboy's Annual"

("The Boys Own Paper" Office. 3/6 net)

Tales of adventure and school life, and articles on sport and travel form the chief attractions of this excellent annual. In addition there are articles on boxing and rowing, with an account of the making of a surf-rider that will provide good fun on English beaches. These contributions are by writers who are well-known to boys and thoroughly understand their needs, and the result is a feast of good reading, well illustrated by means of four full-page colour plates and many drawings.



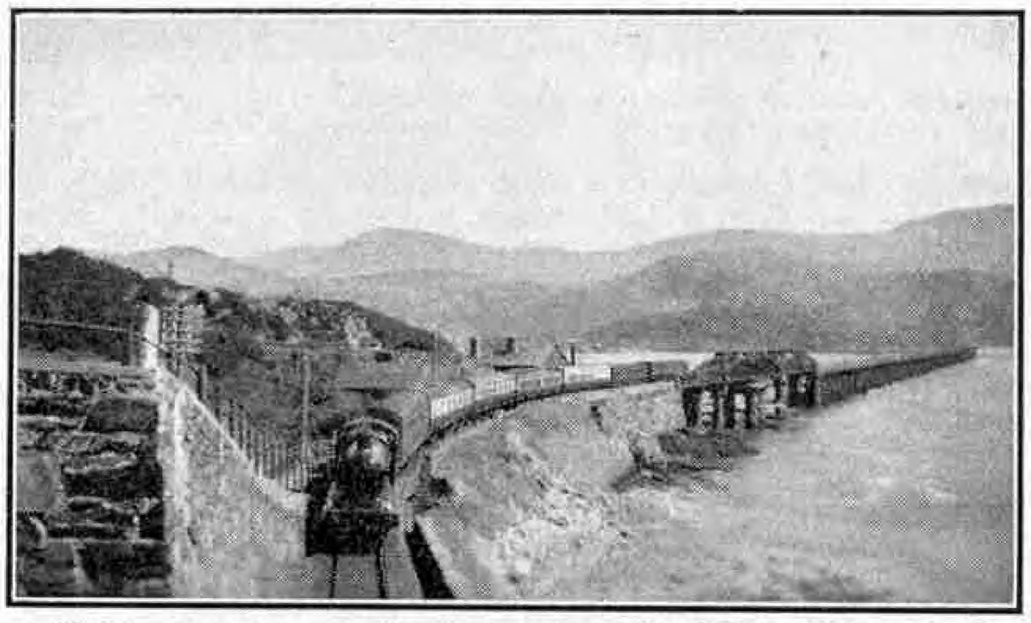
These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Bound for the Cambrian Coast

Between Ruabon and Barmouth, on the G.W.R. line to the Cambrian Coast, trains run through what I think is one of the loveliest stretches of lineside scenery on that railway. For the first 20 miles the line passes through the fertile valley of the Dee, with mountains towering on each side. Then for four miles it follows the shore of Lake Bala, the largest natural lake in Wales. Soon after the mountains close in, and the train puffs painfully up a series of steep gradients to the head of the valley, 770 ft. above sea level.

Ahead the great mass of Cader Idris can be seen, its summit usually hidden by clouds, after which the train runs swiftly down the pretty valley of the Wnion, with its lovely woods and rushing cascades, to Dolgelley at the foot of Cader. The next six miles of the line run along the wide estuary of the Mawddach. When the tide is out, herons may be seen fishing in the pools, and cows graze peacefully by the side of the water. Near the river mouth the line passes through Barmouth, curves sharply and crosses the river by the bridge shown in the accompanying illustration. This is half a mile long, and the main span across the river channel is of steel, the rest being of wood.

R. C. HILL (Harrow).



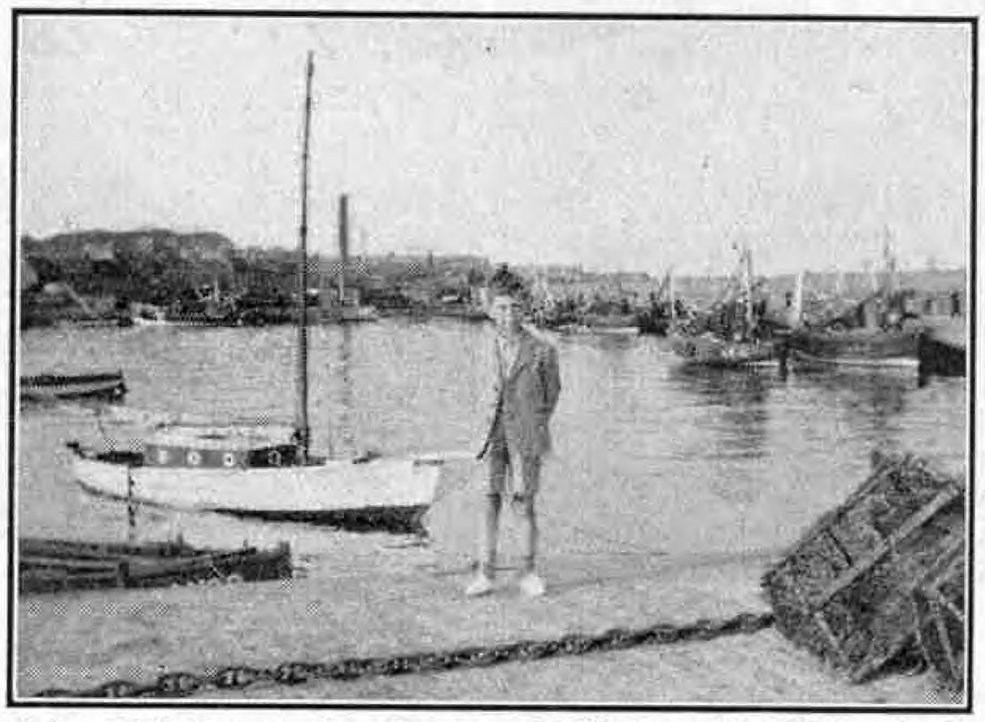
A G.W.R. express from London leaving Barmouth Bridge, which crosses the River Mawddach. Photograph by R. C. Hill, Harrow.

Arbroath Harbour

The old Scottish town of Arbroath has a very quaint harbour. It is almost completely enclosed, the narrow entrance being marked by two small electrically-operated lighthouses. The harbour is shown in the lower illustration on this page. It is used chiefly by fishing vessels, but a number of launches and yachts also are to be seen there. In the foreground are a number of lobster traps. When in use, bait is placed in the bottom of the trap. The lobster sees this, crawls in to eat it, and once in cannot get out again. About 10 lobsters a trap is regarded as a good catch.

The fishing boats are mainly employed in herring and haddock fishing. The haddock are smoked in Arbroath and sold as kippers, sometimes called "smokies." It is possible to walk round the harbour wall, on which is a cobbled roadway, and early in the morning I have seen the catches being unloaded into lorries on the wall for despatch inland.

I. H. LANGLANDS (Thornton Heath).



Arbroath Harbour, seen from the quay wall. Photograph by I. H. Langlands, Thornton Heath.

An Ancient Cornish Village

While on holiday in Cornwall I looked round an ancient village of more than 1,500 years ago a few miles west of St. Ives. The West Cornwall Field Club started excavation there in 1933, and have exposed several dwelling houses and parts of the surrounding wall of the settlement. Most of the houses consist of a central paved courtyard with rooms opening off it, and in most cases the whole dwelling appears to have been unroofed, except for the sleeping quarters, which apparently had a temporary roof of branches and reeds. A well-preserved drainage system was discovered running from the higher ground on the east to the valley on the north-west.

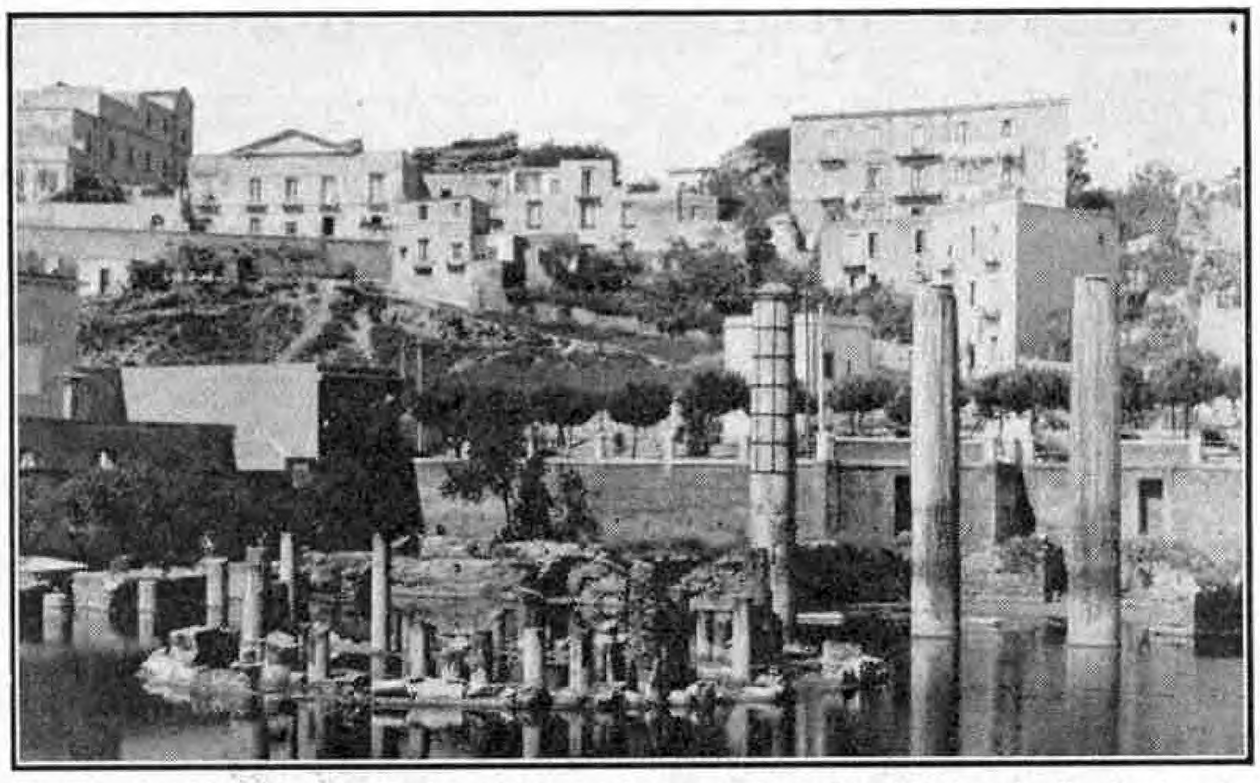
Several fireplaces have been found, and one of them looks rather like a stone armchair. All the other fireplaces were flat hearths, and the purpose of this peculiar structure was unknown until a Danish archæologist put forward the likely suggestion that it was for drying corn.

The stone wall surrounding the camp is about two feet thick, and on top of it a row of stakes were probably placed. Near one of the smaller entrances there is a peculiar stone structure half buried in the ground. This is one of the artificial caves known as "fougous." It has been suggested that they were used as storehouses for food.

G. OWEN (York).

Temple that Rises and Sinks

To the west of Naples there is a great volcanic zone extending from the Hill of Posillipo to Monte di Procida. This is very interesting on account of its volcanic nature and its fertility, and also because of its history, for many ancient Romans built their country residences there. Hot springs, openings through which gases emerge and other wonders of nature are to be found. Two of these of special interest are the Grotto of the Dog and the Solfatara. The former is a grotto partly filled by carbon dioxide, and owes its name to the animal they used to take in to show the presence of the suffocating gas, which is heavier than air and collects above the floor of the grotto. The Solfatara is an almost extinguished volcano where the visitor can see ditches containing great qũantities of boiling mud or lava.



The Temple of Serapis, near Naples, which stands on a section of land that sank after the temple was built and has now risen again. Photograph by G. Papa, Naples, Italy.

Most remarkable of all, there is a section of land in this district that is always on the move. It has sunk gradually, and now after a long time has returned almost to its former level. The changes have taken many years to complete and were discovered by watching the ruins of an imposing temple consecrated by the ancients to Serapis, an Egyptian divinity specially worshipped as a god of healing.

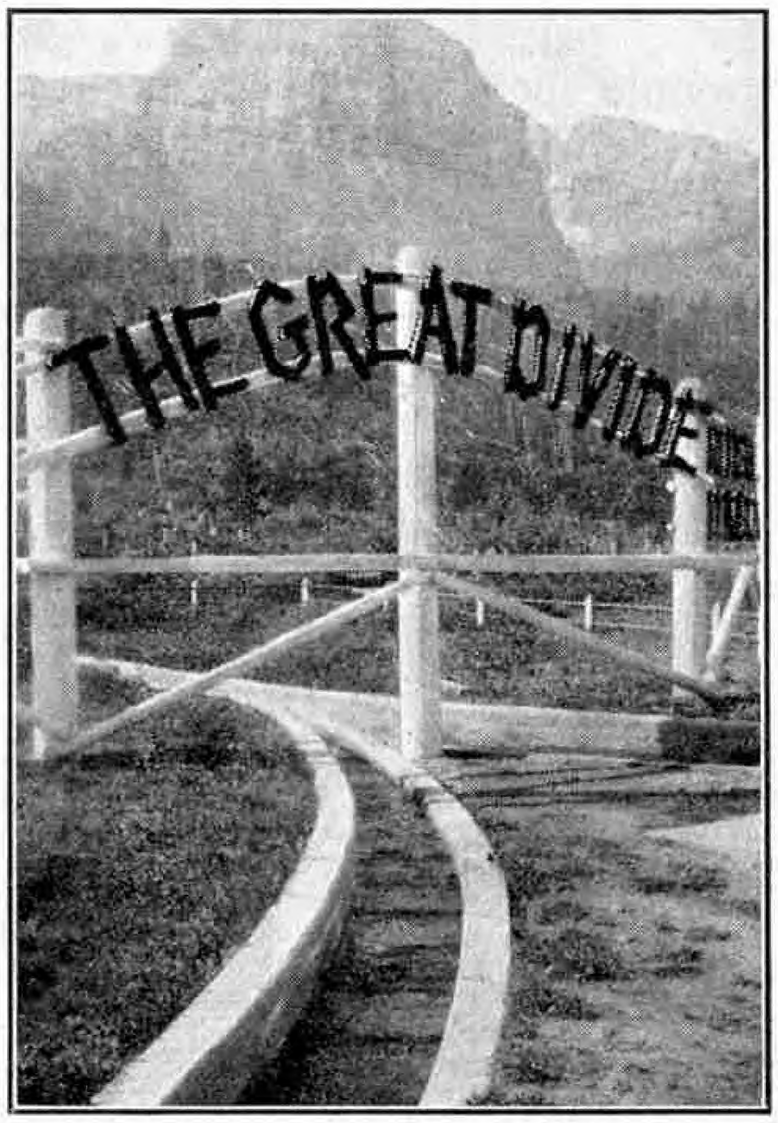
At times the basement and part of the columns of the temple that still remain were under the sea, for they show perforations that are the work of a small marine boring animal. Yet the temple was built on dry land and to-day is again almost above sea level. The sinking came to an end about 350 years ago, and since that time the land has slowly risen. The markings can be seen on the columns in the accompanying illustration of the temple ruins.

G. Papa (Naples, Italy).

The Great Divide

On several occasions I have had the good fortune to visit the Great Divide, an irregular imaginary line that runs roughly north and south from the far North down into United States, and marks the watershed of the Rockies. In Canada, the line in places is the boundary between British Columbia and Alberta and west of Lake Louise it is marked by a white fence, as seen in the lower illustration on this page.

The waters on the two sides of the Great Divide flow in opposite directions, on the west to the Pacific and on the east to the Arctic or Atlantic Oceans. For instance, south of the white fence is a mountain creek that flows into the concrete channel seen in the illustration. The channel forks at the fence, and the west branch flows by way of the Frazer river into the Pacific. The east branch has a much longer journey. It enters the Bow river, which flows down into the prairie country to join the south branch of the Saskatchewan. The south and north branches of the Saskatchewan unite east of Prince Albert, and flow into Cedar Lake, which empties into Lake Winnipeg. The Nelson river has its source in the latter lake and flows into Hudson Bay, a remote arm of the Atlantic.



The Great Divide in the Canadian Rockies. Photograph by G. Adlam, Calgary, Alberta.

When you are standing in the middle of the Rockies, with majestic peaks on all sides, it seems incredible that a twig dropped into this little brook may ultimately find its way into one of two oceans, 3,000 miles apart.

G. H. Adlam (Calgary, Alberta).

Salvage in Scottish Waters

Older readers of the "*M.M.*" will remember the sinking of H.M.S. "*Natal*" during the Great War. She was lying at anchor off Invergordon in the Cromarty Firth when there was a terrific explosion, and she sank like a stone. The ship has remained there on her port side in only six fathoms of water for about 20 years and during this time has been a menace to shipping.

A few years ago a firm salvaged a certain amount of her ironwork, but could recover no more than 1,000 tons. Another company, with the aid of the Government, has now taken on the job of breaking up the hulk. They commissioned the S.S. "*Disperser*" of Stockton-on-Tees, and this vessel has already succeeded in raising some 1,500 tons of metal. The "*Disperser*" is of rather unusual construction, as I discovered when I went along to see her at work recently. She was built at Port Jackson, New York, and is about 70 ft. in length overall. She is flat-bottomed, and as the loads of iron were being swung aboard she listed over to an alarming extent. The loads weighed eight or nine tons each, and her jib crane was taxed to the utmost when lifting them.

I could follow the movements of the diver by the trail of bubbles, and it was most interesting to see a great white blob rush to the surface and be pulled in the diving boat, face downwards. The diver's job is no bed of roses even in these shallow waters. One man had his hand badly lacerated when a plate of metal slipped and pinned it down. The tide has to be watched or the divers' boat may be left high and dry on the shell of the "*Natal.*" W. Crichton (Glasgow).

Elektron Parts Used With Meccano

Ideas for Electrical Models

ELECTRICAL devices of one kind or another are often required in building Meccano models and while some of the more simple of these can be assembled quite easily with the aid of the parts included in the Meccano range, there are occasions when the special solenoids, contact breakers and other parts from an Elektron Electrical Outfit are of great assistance. By using these in conjunction with Meccano parts almost any kind of electrical mechanism likely to be required in a model can readily be put together. All the Elektron parts are obtainable separately, and in this article we are describing a few of their many different applications in connection with Meccano model-building.

One of the first essentials in building up any electrical mechanism in Meccano is a means of insulating one metal part from another to which it is bolted. Fortunately a means of doing this is provided by the special 6 B.A. Nuts and Bolts included in the Elektron range and the Meccano Insulating Bushes and Washers (Parts Nos. 182 and 182a respectively).

The Insulating Bushes and Washers are somewhat similar in appearance to the Meccano Washers, but are made of fibre instead of metal. The Insulating Bush has a small ridge around the hole through its centre, which fits exactly into a standard Meccano hole thus preventing the shank of a 6 B.A. Bolt passed through the Bush from touching the Plate or other part to which it is attached. For example, when it is required to insulate a Strip from a Flanged Plate, a 6 B.A. Bolt is first pushed through one of the holes in the Strip and an Insulated Bush is placed on its shank. The Bolt is then passed through the desired hole in the Flanged Plate and its shank is fitted with an Insulated Washer and a 6 B.A. Nut, the latter being screwed up tightly.

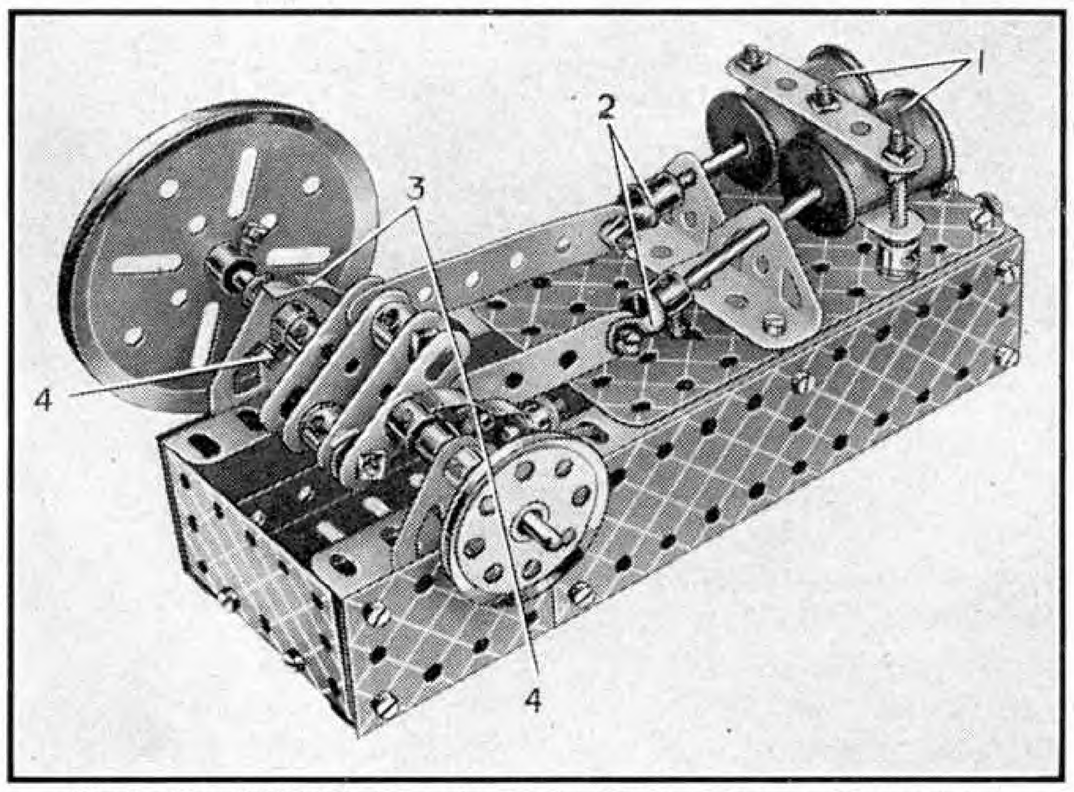


Fig. 1. A model horizontal engine operated by two Elektron Magnet Coils.

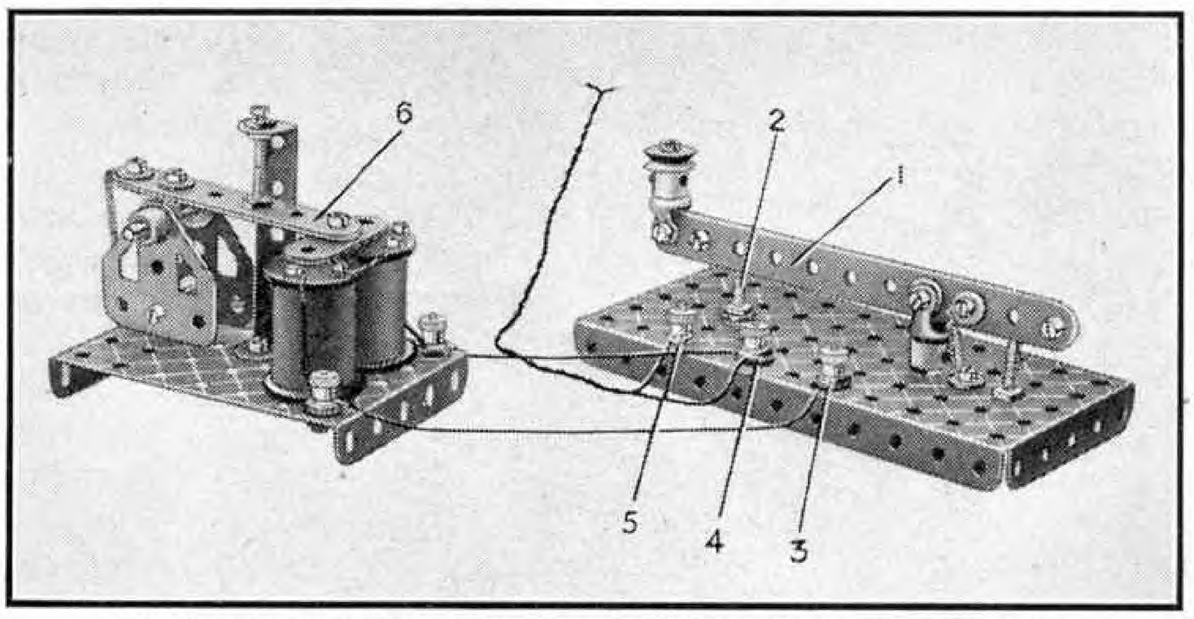


Fig. 2. It is easy to learn the Morse code with this tapper key and buzzer.

A good example of the use of 6 B.A. Bolts in building up an electrical model is illustrated in Fig. 4. This shows part of a model in which it is necessary to fit several bulbs on a rotating beam, a method of construction that is sometimes required in illuminating models such as roundabouts. As the beam has to be free to rotate it is impossible to carry wires direct to the bulbs, and the best plan is to use a rotary current collector. This consists of a Wheel Flange 2, which is fixed on to the shaft of the model by a Bush Wheel. The Wheel Flange is insulated from the Bush Wheel by means of 6 B.A. Bolts, Insulating Bushes and Washers as described above, and it picks up the current from a Pendulum Connection 1 (Part No. 172). The Pendulum Connection is insulated from the main frame of the model, and one wire from the Transformer or battery is fitted to the shank of the 6 B.A. Bolt by which the Pendulum Connection is attached. The wire is gripped by an Elektron Terminal 3 screwed on to the Bolt. The other wire from the Transformer is connected to the frame of the model.

A Lamp Holder 4 (Elektron Part No. 1534) is secured to the beam by an insulated 6 B.A. Bolt. The Lampholder is not insulated from the beam, however, but makes electrical contact with it. A Terminal is screwed on to the end of the 6 B.A. Bolt and connected by a wire to the Wheel Flange 2. The best wire to use for connecting purposes is Elektron No. 23 Gauge S.C.C. Copper Wire (Elektron Part No. 1587).

Rotary current collectors of this type also can be used to good effect in model big wheels, and there are many other instances in which they are useful.

By this time readers will have realised that the Elektron 6 B.A. Bolts and Insulating Bushes and Washers open up a tremendously wide field of subjects for models. Switches, flashing electric signs and electric locomotives fitted with proper current collecting gear are all easy to build when it is possible to insulate one part from another. A useful example is the overhead current collector or pantograph for an electric locomotive shown in Fig. 3. The construction of this is simple and when completed it is mounted on the roof of the locomotive by insulated 6 B.A. Bolts. The current is picked up from an overhead conductor wire by a curved collector 8 and is conveyed to the Motor inside the model by the wire 12. For the collector No. 26 Gauge Copper Wire (Elektron Part No. 1584) is used.

Many model-builders no doubt will be familiar with the Elektron Magnet Coils (Elektron Part No. 1538). These can be used in a great number of really fascinating

working Meccano models. The Coil is approximately 1″ in length and ¾″ in diameter, and it is supplied with a special removable metal Core (Elektron Part No. 1539), a portion of which carries a 6 B.A. thread so that the Core can be attached to a model in any desired position.

The Magnet Coils are intended to be operated from the 3.5-volt circuit of a T6A or T20A Transformer, but if four or more of them are wired together, they may be connected up in the 9-volt circuit of a T6, T6A or T6M Transformer.

One use of the Coils is in forming a hoisting magnet for an electric crane. For this purpose two Coils can be mounted on a Magnet Yoke (Elektron Part No. 1541), or alternatively the yoke can be built up from Meccano parts as shown in Fig. 5. In this case four Coils are attached to a Face Plate and are wired together in series, that is, the inner terminal of one Coil is joined to the outer terminal of the next Coil, and so on. A 1″ Rod is locked in the boss of the Face Plate and it carries an End Bearing that provides a means of attaching the magnet to the crane hook.

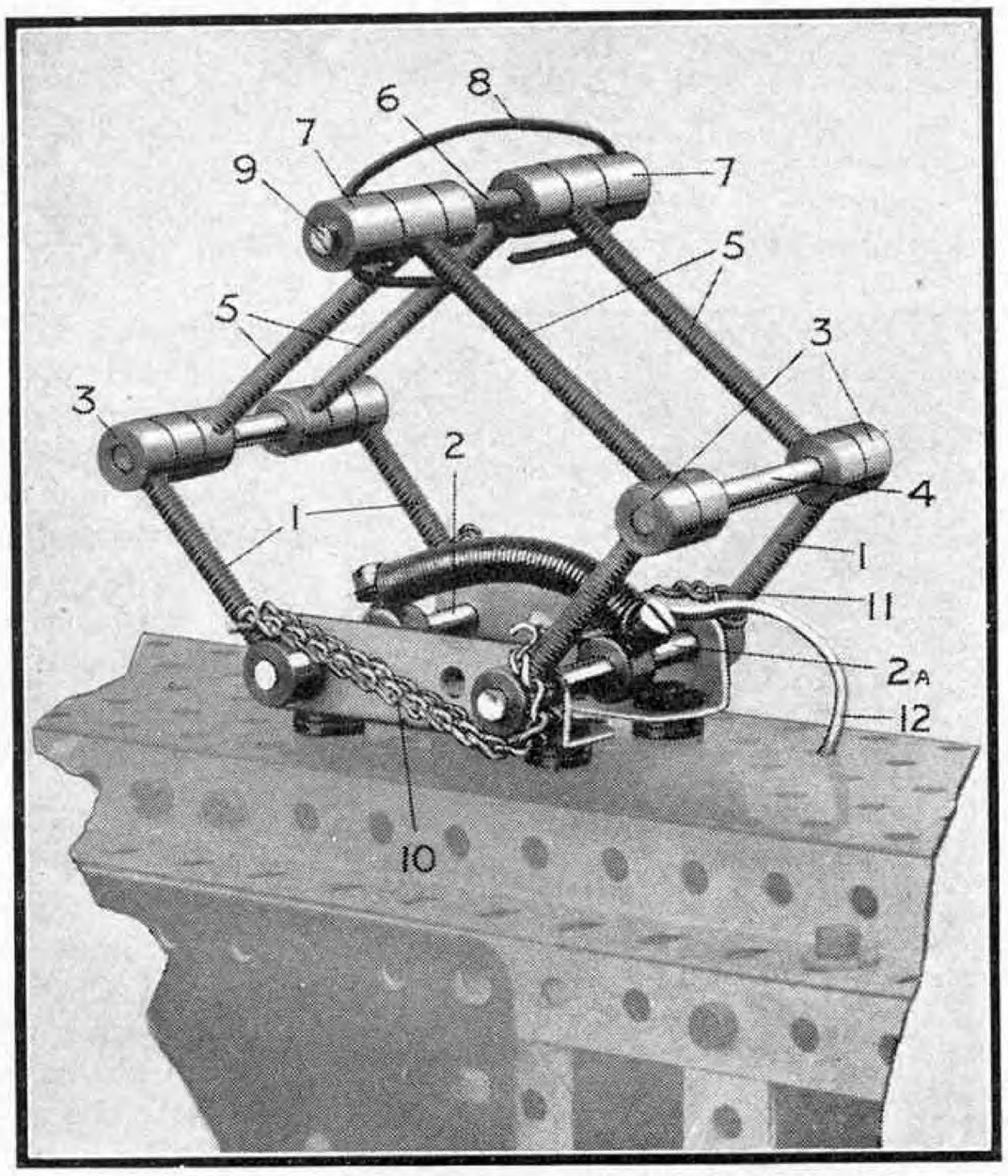


Fig. 3. A pantograph current collector for use on model electric locomotives.

Another good use for Elektron Magnet Coils is in building up electric engines such as that shown in Fig. 1. In the small horizontal engine illustrated the motive power is supplied by two Coils, the cores of which are connected to the crankshaft through connecting rods.

The engine is operated by first passing a current through one of the Magnet Coils. The core of this Coil is then sucked inward and as it is connected to the crankshaft the latter is pulled round half a turn. The current is then switched off, but the impetus of the flywheel maintains the crankshaft in motion until it has passed "dead centre." Current is then passed through the second Coil, and the core of the latter pulls the crankshaft through the remaining half turn. The process of switching the current to the Magnet Coils on and off, is carried out automatically by two commutators. Each of these consists of a Pendulum Connection 3 fixed by a 6 B.A. Bolt to an Angle Bracket, which is bolted to the base but insulated from it by Insulating Bushes. The end of the 6 B.A. Bolt is provided with a Terminal. The Pendulum Connection is curved so that the bolt 4 which is screwed into the tapped holes of a Collar on the crankshaft, makes contact with its surface when the crankshaft rotates.

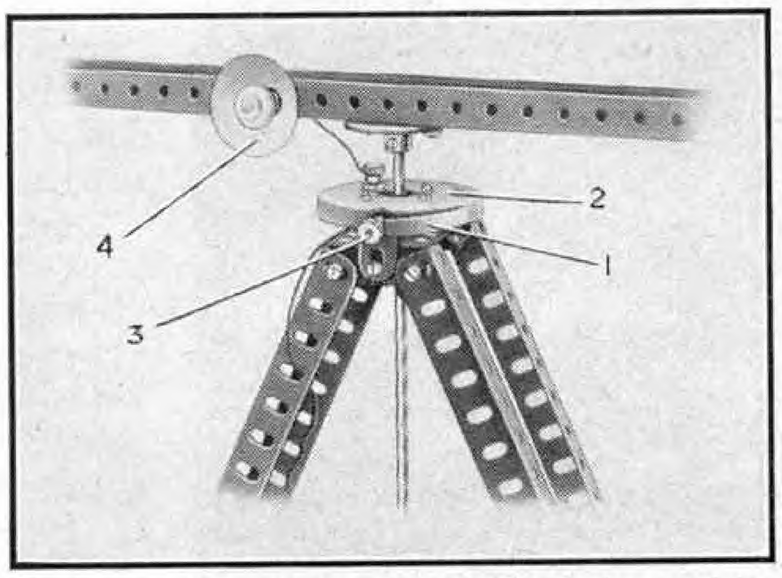


Fig. 4. A rotary current collector suitable for supplying current to rotating structures such as roundabouts.

The Pendulum Connections are each connected by wire to the outer terminals of the two Magnet Coils 1. The inner terminals of the Coils are each connected to an insulated 6 B.A. Bolt fixed at the rear of the base to serve as a terminal for one of the Transformer leads. The second Transformer lead is "earthed" to any convenient point of the frame of the model.

Readers who are interested in telegraphy and wish to learn the Morse Code used in signalling by this means, should build up the simple Morse tapper and buzzer shown in Fig. 2. Both make use of Elektron parts in conjunction with Meccano parts and they are quite simple to assemble.

The tapper consists of an arm 1, built up from three 5½″ Strips and pivotally mounted as shown in the arms of an End Bearing attached to a 5½″ × 2½″ Flanged Plate. The rear end of the arm is held by a length of Spring Cord against a stop formed by a ¾″ Bolt. An insulated 6 B.A. Bolt 2 is fixed to the Plate under the forward part of the arm, and is connected by a short length of wire to a second insulated Bolt 3. The latter is also joined by wire to one of the terminals of the buzzer. The two wires from the Transformer are fixed to 6 B.A. Bolts 4 and 5 on the 5½″ × 2½″ Flanged Plate. Bolt 4 is insulated from the Plate with an Insulating Bush and Washer and is connected to the second terminal of the buzzer, but Bolt 5 is in electrical contact with the Plate. The terminals of the buzzer are joined up to the Magnet Coils so that when the tapper arm is depressed and touches the contact 2 the circuit is completed and the Coils energized.

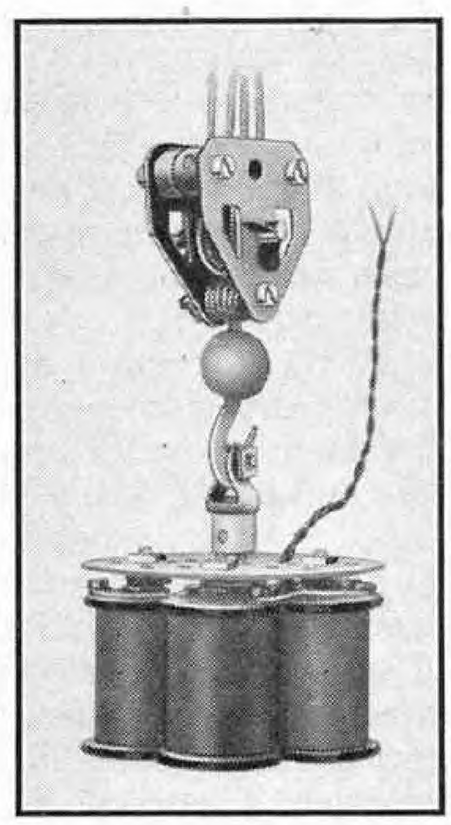


Fig. 5. Elektron Magnet Coils can be used in conjunction with Meccano parts to build up powerful magnets for cranes.

The buzzer consists of two Coils complete with Cores mounted on a 3½″ × 2½″ Flanged Plate. Above the Coils is a vibrating arm formed by two 3″ Strips 6 and two 1½″ Strips. A Double Bracket attached to the Strips 6 is pivoted on a 2″ Rod supported by two Flat Trunnions from the 3½″ × 2½″ Flanged Plate. The 1½″ Strips normally are raised from the ends of the Cores by a length of Spring Cord fixed between the rear of Strip 6 and the baseplate. A 6 B.A. Bolt fitted through a hole in the arm contacts with a second 6 B.A. Bolt attached to a 2½″ × ½″ Double Angle Strip as shown.

Magnet Coils can also be used in building up synchronous motors, relays and other similar mechanisms.

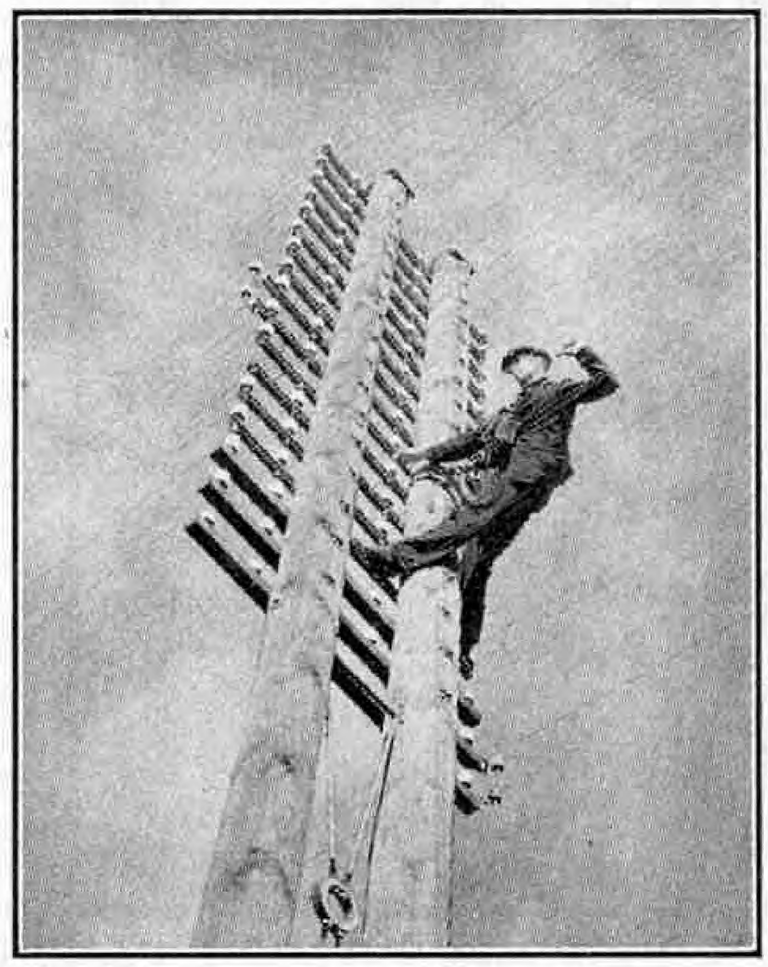
Keeping the Telephone Wires Buzzing

Post Office Linesmen at Work

By Herbert Walters

TO work at the top of a telegraph pole in the midst of a fierce autumn gale or a heavy storm does not sound in the least inviting. But it is all in the daily round of those hardy fellows who are responsible for the maintenance of about 1,300,000 miles of overhead wires and 11,000,000 miles of underground cables in Great Britain.

During the colder months of the year Post Office engineers are kept extremely busy everywhere. Winter nights frequently bring lashing sleet or snow. High winds, reaching gale force at times, scream and moan through the vibrating telephone wires out on the exposed high roads. Somewhere an exchange reports a breakdown on one of the main lines; perhaps a huge tree has crashed against the wires in its fall. Wonderful instruments at the nearest big exchange soon get busy and locate the exact scene of the damage. Then, within only a few minutes, a gang of experienced linesmen aboard a speedy equipment truck are rushing through the night to the spot indicated.



Threading a maze of wires while inspecting overhead telephone wires.

Often a few miles of poles may be involved and masses of tangled telephone wires lie strewn on the road and hedges, and in the fields. Yet no matter how extensive the damage may be, it seldom happens that a breakdown materially affects telephonic communication for more than a few hours. The men can always fix up temporary circuits while the main line is being repaired.

All the important exchanges in this island keep a squad of linesmen ready for emergency day and night. The Post Office has divided the whole countryside into a number of districts, each of which is put in charge of engineers and inspectors. In this way every square yard of country is thoroughly covered wherever telephonic communication exists.

Snowstorms invariably cause the greatest damage to overhead wires during the winter months. Frozen snow clings hard to the wires, and then the transverse winds come along. The strain is so great that a whole line of poles often collapses, and within a matter of seconds some tens of thousands of telephone subscribers are cut off.

Normal weather conditions do not interfere with the overhead wires very much, although in some of the chief industrial districts of England they have been known to break within three or four months of being put up. This is due to chemicals in the atmosphere that causes rapid erosion, however. The Post Office now use special braided covered wires to reduce the harmful effect of the fumes.

Breakdowns on the vast underground system are caused mainly by the presence of water in the cables. This may arise either from mechanical damage, or by corrosion of the cable sheath. Road-mending operations occasionally damage the cables.

The external linesmen of our great telephone service are always kept busy, quite apart from answering calls in times of emergency. In the course of their duties they have to inspect miles of overhead wires to trace minor faults; and this work is done with the aid of small motor vans fitted with glass roofs. These men may climb poles several times during a day and think nothing of it, yet some of the poles on the important main roads are more than 80 ft. high. They climb either with a ladder, or with "climbers," inverted steel spurs strapped to the inside of the legs in line with the ankles. The climbers are jabbed into the pole to provide a hold.

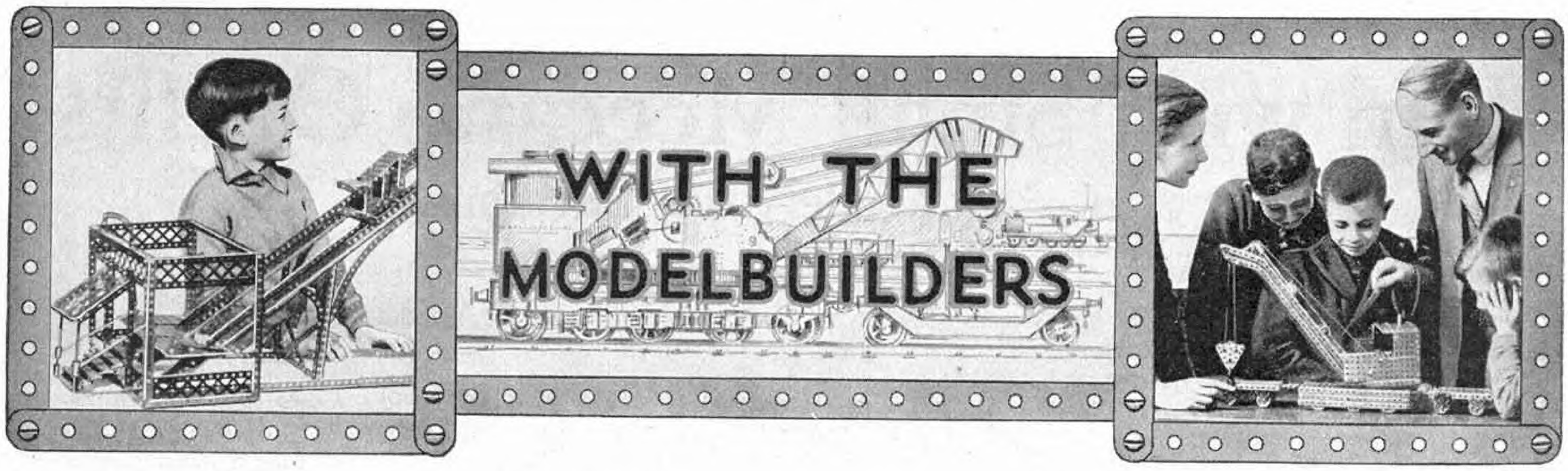
Scotch pine is the timber used almost exclusively for telegraph poles throughout Great Britain. These have a life of 20 or sometimes 40 years, but in spite of this the Post Office erect an average of 136,000 new poles every year. After these have been thoroughly impregnated with creosote they seldom require any further attention.



Jointers at work in an underground cable chamber. The illustrations to this article are by courtesy of the G.P.O.

The majority of the big trunk lines are now carried in underground cables, and every year some tens of thousands of poles are being recovered as more circuits go below. Nevertheless, in the open countryside it is obviously much less costly and more practicable to erect a pole route than to lay the telephone cables in underground conduits.

At the Post Office station at Dollis Hill, on the north-west outskirts of London, young men are trained to become efficient linesmen. Here they learn to repair broken wires on poles 5 ft. or 6 ft. high, though a full-sized one also is provided.



THE TOWER OF EMPIRE

The illustration on this page shows a fine model of the Tower of Empire at the recent Glasgow Exhibition. The model was built by A. Cant, Glasgow W.3, and stands 4 ft. high. Readers who compare the drawing of the actual tower that appeared on page 139 of the March 1938 "*M.M.*" with the accompanying illustration of the model will realise the excellent proportions of the latter, and the skilful manner in which the external appearance of this famous tower has been reproduced.

The framework of the model is composed entirely of Meccano Angle Girders and Strips, and the outer covering consists of thin cardboard painted silver and sea blue. The tower is illuminated by 13 4.5 volt lamps, the current for which is supplied by a Transformer. When viewed in a darkened room the illuminated model is very impressive.

MODEL-BUILDING HINTS FROM READERS

In the hundreds of letters that I receive each week from model-builders all over the world, I regularly find details of time-saving dodges and useful model-building hints that the writers have discovered in the course of their experiments. For example, A.D. Muff, Canterbury, New Zealand, mentions a dodge that he finds useful in assembling intricate gear-boxes. Sometimes, he says, it is a little difficult to place Pinions, Collars, etc. in the required places, but the trouble can easily be overcome by screwing a length of Screwed Rod into the boss of the part and then using the Rod as a handle with which to manœuvre the part into its allotted position. Readers who are building models of complicated gear-boxes particularly will appreciate the practical value of this suggestion, but every model-builder will find good uses for Muff's method.

A. Forsyth, Blackpool, tells me that he often uses a pea bulb for illuminating interiors of models under construction. In order to make the lamp more manageable the wires carrying the current are sheathed in a length of Spring Cord. Forsyth also finds that a Handrail Coupling forms a useful pulley of small diameter for use at the end of a shaft. The Cord or Driving Band is passed around the neck of the Coupling between the boss and the head. If a pulley of this kind is used in conjunction with a 3" Pulley a driving ratio of approximately 10 : 1 is obtained.

Large diameter pulleys are needed for building pit-head gear and similar models, and J. Purley, Devonshire, has devised an extremely neat method by which these can be made. For the rim of each pulley 28 Curved Strips are required. These are bolted together to form two complete circles, each Curved Strip overlapping its neighbour by three holes. The two last Curved Strips must be forced together to allow the last bolt of each ring to be inserted, with the result that all the Curved Strips take up an angle of about 30 deg. to the plane of the wheel. The two rings therefore can be placed together to form a large pulley with a V-shaped groove. The sides of the rim are fastened together by End Bearings, the arms of which are opened out to the required angle. Approximately 16 End Bearings are required to give a good effect, and in their bosses 8" Rods are locked to form the spokes. The inner ends of the Rods are splayed out like the spokes of a bicycle wheel, and are fastened by Collars to two Face Plates mounted on a central Rod. The wheel can be made to rotate truly on its axle by adjusting the tension of the individual spokes.

A MODEL ROAD JUNCTION

Lars Linder, Stockholm, an enthusiastic model-builder who competes regularly in "*M.M.*" contests, finds pleasure in experimenting with Dinky Toys in conjunction with Meccano. Recently he built a clover leaf road junction, of the type that is now becoming popular on the Continent and in America. The framework of the model is built up from Strips and Angle Girders, but the roadways are represented by cardboard. In the cardboard slots are cut, through which jut four 1" Rods attached to carriages below the roadways. Dinky Toys Vehicles are placed over the Rods, and are pulled along by means of an endless belt of Sprocket Chain attached to the carriages below, thus giving the effect of vehicles moving under their own power. The Sprocket Wheels around which the Chain is passed are driven by an Electric Motor.

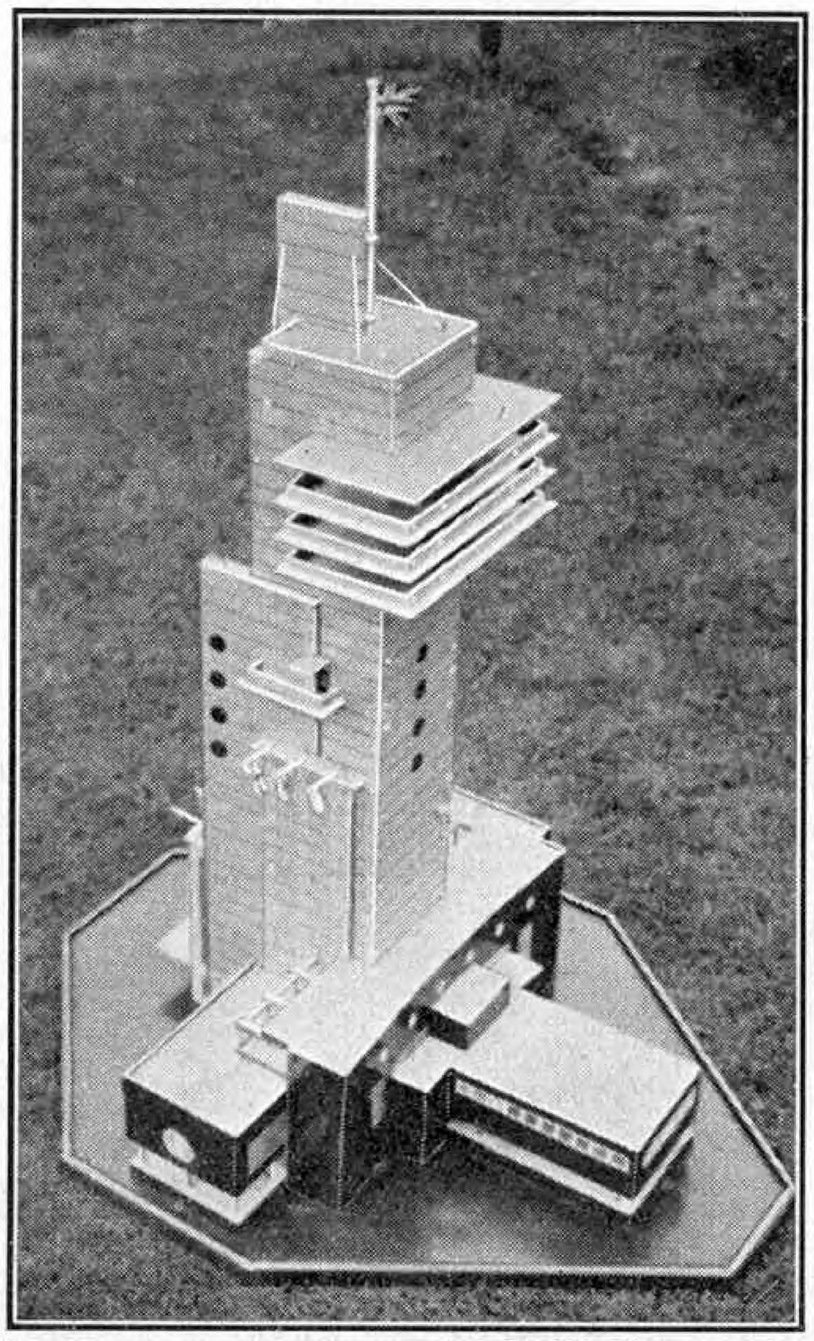
AN INGENIOUS AIR SPEED INDICATOR

Instruments used in the navigation of aircraft make good subjects for Meccano models, and recently G. S. Pearce, Wellington, decided to make a demonstration model of an air speed indicator. Pearce's instrument is quite simple in construction, but is capable of indicating air speeds to within one to two miles per hour of the correct reading. He tested it by holding it out of the window of his father's car while travelling at various speeds, and marked out the scale to correspond with the readings given by the speedometer of the car.

The indicator is a small box-like structure built up from Meccano Flat Plates and Angle Girders, on top of which is the calibrated cardboard scale, which is held in place by two Strips. A 5½" Strip is used for a pointer, and is pivoted on a short Rod passed through two Angle Brackets bolted to the top of the casing of the instrument. A 2" Slotted Strip is bolted to the lower end of the 5½" Strip, so that the two parts overlap two holes.

An 8" Rod is journalled horizontally in the sides of the casing, and at one end, outside the casing, it carries a Designing Table (Part No. 107). This is a piece of wood approximately 6" square, at the centre of which a Bush Wheel is bolted. An End Bearing is fitted on the other end of the 8" Rod and is connected by two Driving Bands, or pieces of strong elastic, to a fixed part of the instrument. At its centre, inside the casing, the Rod carries a Collar, and into this is screwed a bolt that passes also through the slot of the 2" Slotted Strip. Any movement of the horizontal Rod therefore is transmitted to the pointer working in front of the scale.

To use the instrument it is placed with the Designing Table facing forward, so that this is forced backward. The air pressure on the Table is proportionate to the speed at which the instrument is carried ahead, and a direct reading is given on the scale.



The Tower of Empire at the Glasgow Exhibition has been the subject of many good Meccano models, one of the best of which is the fine example constructed by A. Cant, Glasgow W.3, shown in this illustration.

SLIDING GEAR-BOX SHAFTS

A correspondent recently set our model-building staff an interesting problem. He wished to build a model in which a shaft had to slide to and fro while rotating, and he could not see how it was possible to keep the shaft connected to the main gear train while it was sliding backwards and forwards. The idea of filing a flat on the shaft so that the gear could remain stationary did not appeal to him, because the shaft would be spoiled for future use.

The solution suggested by our model-building staff is as follows. The gear is left loose on the shaft and into its boss is screwed a 1" Screwed Rod. The latter is locked in position by a nut, and a 3½" Rod is fixed firmly to its end by a Collar. The Rod is arranged so that it is parallel with the main shaft, and a Coupling is then fitted over the ends of the main shaft and the 3½" Rod. One of the grub screws is tightened up to lock the Coupling on the main shaft, but this is left free on the 3½" Rod.

With this arrangement the shaft can be moved backwards and forwards freely within the limits set by the 3" Rod, and no matter what position it is in the drive is still taken from the gear train.

A SIMPLE MACHINE FOR WINDING SOLENOIDS

After reading the paragraph describing the use of solenoids that appeared on "*With the Model-Builders*" page in the October "*M.M.*" S. Johnson, Shoreditch, set to work to design a machine for winding his own solenoids. The one he built is of very simple construction, but works quite satisfactorily. It is built up on a base consisting of a 5½" × 2½" Flanged Plate, to which two sets of Architraves are bolted 3½" apart to form the bearings for a small Crank Handle and a 3½" Screwed Rod. A Meccano Bobbin is mounted at the centre of the Screwed Rod, and is locked in position by two nuts. At one of its ends the Screwed Rod carries a ¾" Sprocket Wheel, which is connected by Sprocket Chain to a 1½" Sprocket Wheel on the Crank Handle. The reel carrying the wire is fitted loosely on the shaft of the Crank Handle.

In order to prevent the wire from running too quickly off its reel, the latter is provided with a friction brake consisting of a Strip tensioned by means of a length of Spring Cord.

LOW FRICTION BEARINGS FOR VERTICAL SHAFTS

While building a model clock recently, T. Lomas, London, discovered that several vertical shafts were introducing an undue amount of friction into the mechanism. The shafts concerned were journalled in holes in Meccano Plates and were supported by Collars bearing on the Plates. He decided to try to reduce the friction as much as possible and in the course of his experiments to this end designed two interesting new bearings specially suitable for shafts that have to be journalled in a vertical position.

One of the bearings consists of a Coupling, into one end of which the plain shank of a Threaded Pin is pushed. The Threaded Pin is fastened in position by its threaded portion and the shaft bears upon its rounded end.

The other bearing is built up by fitting a Steel Ball into one end of a Socket Coupling and fixing it in position by a Grub Screw. A Collar is pushed into the other end of the Socket Coupling and the bearing is then ready for mounting.

A SIMPLE TYPE OF CLUTCH

A Meccano clutch need not be of the friction disc type that is so often used in motor chassis models. There are other simple types of clutches for various purposes, all of which can readily be built up from Meccano parts. For instance, a clutch device for preventing damage to a driving Motor due to overloading can be built up from an Angle Bracket and a Spring Clip. The Angle Bracket is bolted to a 57-teeth Gear loose on its Rod. The Clip is pressed on the Rod so that its wings engage the Angle Bracket.

Fun with Small Meccano Outfits

Amusing Models for Christmas

ONE of the greatest attractions of a Meccano Outfit is that it can be used for building models of so many different kinds. It is just as fascinating to build small and amusing models as it is to reproduce exactly some wonderful engineering structure or a remarkable machine. At this time of the year with parties and amusements of all kinds ahead of us, it is the lighter side of model-building that arouses the greatest interest, and in this article we are explaining the building of amusing mechanical toys that will interest younger folk and grown ups alike. These models are just the thing for the proud possessor of a Meccano Outfit, for they require only a few parts and can be put together quickly and easily with the help of the descriptions given below and of the illustrations, which are photographs of the actual models.

The first of these models is a Trick Tricyclist, and he is shown in Fig. 1. The contents of Outfit No. 2 are sufficient for his construction, and a *Magic* Motor is just the thing to make him work. Then he pedals furiously and travels along at great speed with an almost comical air of being engaged in important business.

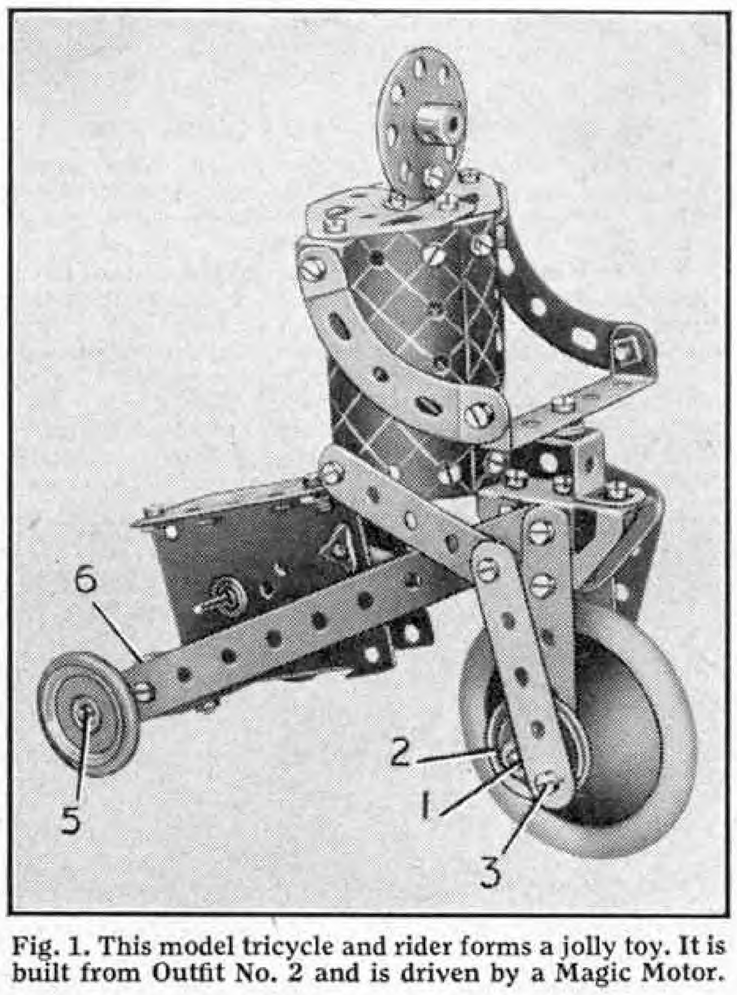


Fig. 1. This model tricycle and rider forms a jolly toy. It is built from Outfit No. 2 and is driven by a Magic Motor.

The tricycle should first be assembled. To begin with two Trunnions are bolted together, and to them are attached two $2\frac{1}{2}''$ Strips and two $5\frac{1}{2}''$ Strips. The $5\frac{1}{2}''$ Strips are bent outward, and then spaced apart by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip bolted in the second holes from their rear ends. A $3\frac{1}{2}''$ Rod 5 is next passed through the end holes of the Strips, and to it a $\frac{1}{2}''$ Pulley 6 and two 1″ Pulleys complete with Rubber Rings are fitted. Spring clips hold the Rod 5 in position. The front wheel is fastened on a 2″ Rod 1. The handlebars are mounted on a Reversed Angle Bracket, but are spaced from it by a nut and two Washers. The *Magic* Motor is then bolted to the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip at the rear of the tricycle, as shown in the illustration.

The rider's body consists of three Curved Plates bolted together to form a cylinder, to the upper end of which two Flat Trunnions are fixed by means of an Angle Bracket. The head is a Bush Wheel, and is held in place by an Angle Bracket. Two $2\frac{1}{2}''$ Curved Strips form the arms. The rider's body is connected by Angle Brackets to the Trunnion and to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate covering the Motor.

The next step is to fix an Angle Bracket to the 1″ Pulley 2 by means of a bolt and two nuts, another Pulley also with an Angle Bracket fitted to it, being fixed to the other end of Rod 1. Each of the cyclist's legs consists of two $2\frac{1}{2}''$ Strips bolted together end to end, with two nuts on each bolt, and they are attached to the body of the rider and also to the Angle Bracket on 1″ Pulley 2 by Bolt 3, on which they can pivot when he is pedalling. To complete the model a Driving Band is arranged to drive the Pulley 6 on Rod 5, and all that then remains is to set it in motion and enjoy the fun.

Parts required to build the model trick tricyclist: 2 of No. 2; 6 of No. 5; 8 of No. 12; 1 of No. 16; 1 of No. 17; 4 of No. 22; 1 of No. 23a; 1 of No. 24; 38 of No. 37; 8 of No. 37a; 2 of No. 38; 2 of No. 48a; 2 of No. 90a; 1 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 155a; 1 of No. 186; 1 of No. 187; 1 of No. 188; 1 of No. 199; 2 of No. 200. 1 ***Magic*** Motor (not included in Outfit).

Another easily-built toy with a very "busy" movement is the hand-car shown in Fig. 2. It seems to be a little too much for the two Meccano men in charge of it, but if they are helped by giving the car a push in the rear they appear to be working very hard indeed, and the same result follows when the model is hauled along the ground.

The frame of the model is built up of two $12\frac{1}{2}''$ Strips bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and joined at their ends by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The axle for the Road Wheels is journalled direct in the $12\frac{1}{2}''$ Strips, and the Rod on which the 1″ Pulleys are mounted is carried in two Trunnions.

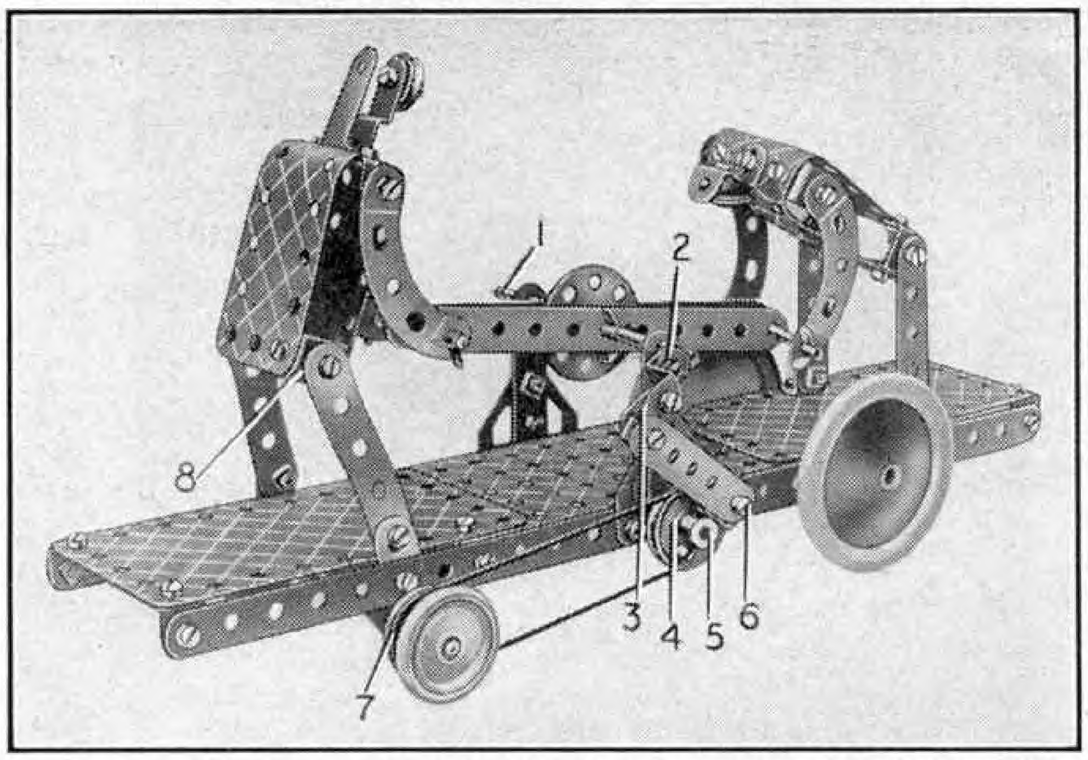


Fig. 2. A model hand-car that can be built from the contents of Outfit No. 3. The men work with surprising vigour as the car moves along.

At the centres of the sides two vertical $2\frac{1}{2}''$ Strips are fixed, and they carry in their upper end holes a 4″ Rod 1, held in position by Spring Clips. This Rod is fitted with a Bush Wheel to which the operating beam is fastened. The beam is moved up and down by a crank arrangement built as follows. The lug of a Rod and Strip Connector 2 is bent at right angles, and to it is bolted a Reversed Angle Bracket, the free arm of which is extended by a Flat Bracket 3. The latter is connected by a $2\frac{1}{2}''$ Strip to a 1″ Pulley 4 on a $3\frac{1}{2}''$ Rod 5, and the bolt 6 is fixed by means of two nuts to an Angle Bracket fixed to the boss of the Pulley 4. The bolt holding the Angle Bracket in place carries three spacing Washers under its head. Pulley 4 is driven from Pulley 7 by a Driving Band.

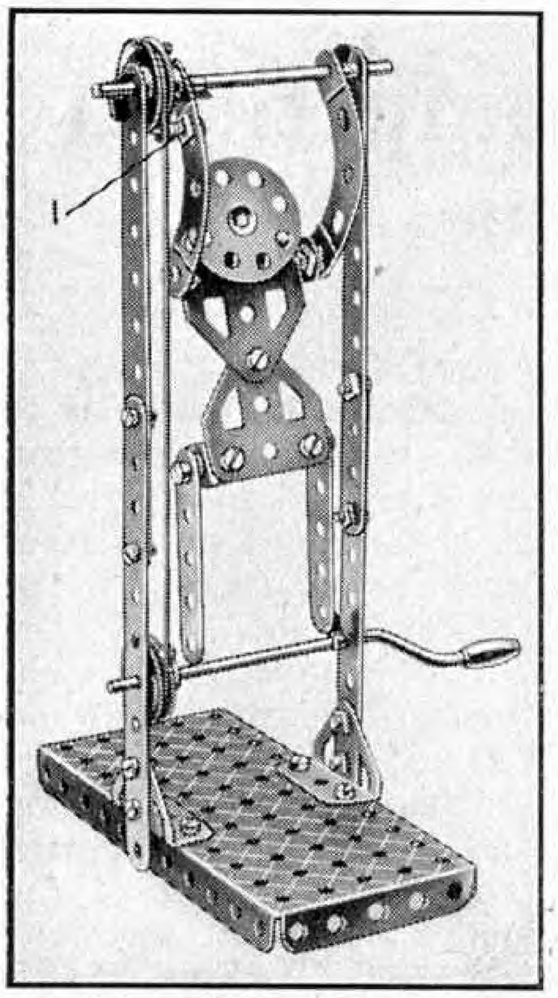


Fig. 3. Outfit No. O contains all the parts required for this attractive model.

A $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate forms the body of each figure, the ends of the Plate being joined by a Double Bracket 8. Angle Brackets are then bolted to the Plate and to them are pivoted the arms and legs. The legs of the figures are bolted securely to the sides of the car in the manner shown.

Parts required to build the model hand-car: 2 of No. 1; 2 of No. 2; 7 of No. 5; 4 of No. 10; 2 of No. 11; 8 of No. 12; 2 of No. 15b; 2 of No. 16; 2 of No. 17; 4 of No. 22; 1 of No. 23; 1 of No. 24; 6 of No. 35; 44 of No. 37; 12 of No. 37a; 6 of No. 38; 1 of No. 44; 2 of No. 48a; 1 of No. 52; 4 of No. 90a; 3 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 155a; 1 of No. 176; 1 of No. 186; 2 of No. 188; 2 of No. 191; 1 of No. 212; 2 of No. 217b.

The acrobat shown in Fig. 3 will greatly amuse the younger members of a family or party, who will never tire of his antics, and of turning the handle. Only parts contained in Outfit No. O are needed to build him and those required can be put together easily in a few minutes.

First bolt two Trunnions to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. Then make two uprights by bolting together two $5\frac{1}{2}''$ Strips with four holes in each overlapping, and bolt these to the Trunnions. Next fit a small Crank Handle into the proper holes in the uprights, as shown in the illustration, taking care to include the 1″ Pulley that also can be seen in the picture.

Two Flat Trunnions form the body of the acrobat, and to each of them are fixed two Angle Brackets. Two $2\frac{1}{2}''$ Curved Strips bolted to the upper Angle Brackets form his arms, and $2\frac{1}{2}''$ Strips are used for his legs. Use two nuts on each of the bolts fastening on the arms and legs to prevent these from working too loose.

Next push a $3\frac{1}{2}''$ Rod through the end free holes of the Curved Strips and through a 1″ Pulley, and then fit it in the upper end holes of the uprights, with Spring Clips to hold it in position. Fix a bolt 1 on one arm of the acrobat, so that the bolt engages with the head of a $\frac{3}{8}''$ Bolt screwed into the boss of the Pulley. The two 1″ Pulleys are then connected by a length of Cord, and the acrobat is ready to begin his performance.

Parts required to build the model acrobat: 4 of No. 2; 2 of No. 5; 1 of No. 10; 4 of No. 12; 1 of No. 16; 1 of No. 19s; 2 of No. 22; 1 of No. 24; 4 of No. 35; 18 of No. 37; 22 of No. 37a; 2 of No. 38; 1 of No. 52; 2 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a.

The next model makes use of a *Magic* Motor to give it movement. It is the robot shown in Fig. 4, and when the Motor is set in motion the figures vibrate and rocks to and fro in a most amusing manner. The parts required are all in Outfit No. 1.

In this model the *Magic* Motor 2 is placed in the body of the robot, which consists of two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 1 overlapping along their long edges and joined by two Flat Trunnions. The Motor is placed so that its winding shaft juts out through the central hole of the lower Plate 1. Angle Brackets are bolted to the upper corners of the Motor and are attached to the upper Flexible Plate by lock-nutted bolts 3 that hold also Trunnions.

The robot's head is a Bush Wheel attached to one of the Trunnions by an Angle Bracket and a Flat Bracket.

Parts required to build the model robot: 2 of No. 2; 3 of No. 10; 7 of No. 12; 2 of No. 22; 1 of No. 24; 21 of No. 37; 5 of No. 37a; 2 of No. 38; 2 of No. 90a; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 189. 1 *Magic* Motor (not included in Outfit).

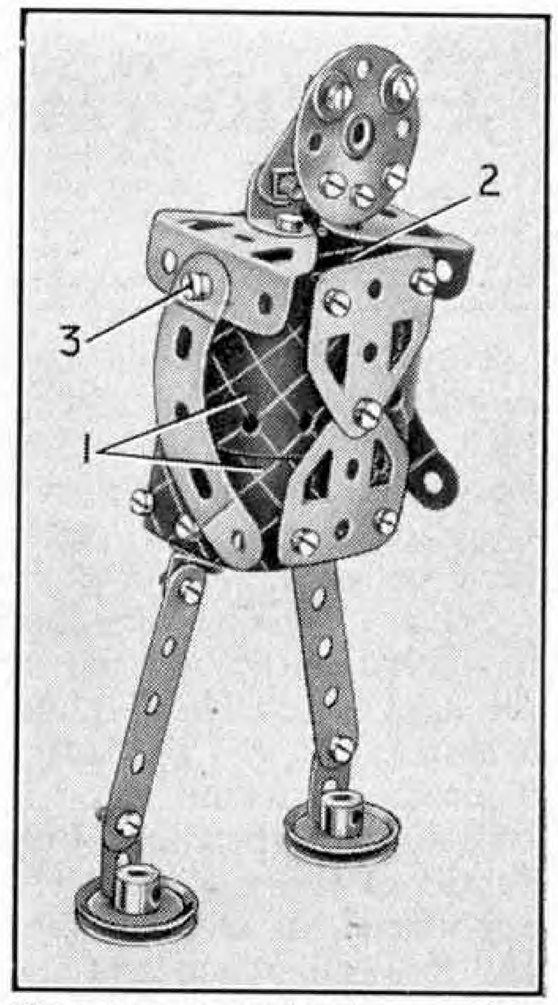


Fig. 4. A Meccano robot that can be built from Outfit No. 1.

What is perhaps the best and the most humorous of all these models has been kept for the last! It is the bucking broncho shown in Fig. 5. With a Meccano *Magic* Motor to give it life, the horse kicks up its hind legs and tries to get rid of its rider, who fortunately is an expert horseman and never meets with disaster, although he is badly shaken!

The model is built from the contents of Outfit No. 1. The base is a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to which two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are bolted in the positions shown. To the rear Double Angle Strip is bolted a Reversed Angle Bracket 1 and a Flat Bracket, which together form bearings for a 2″ Rod 2 that carries a Bush Wheel and a 1″ Pulley. The latter part is connected by a Driving Band to the small pulley of a *Magic* Motor bolted to the base-plate.

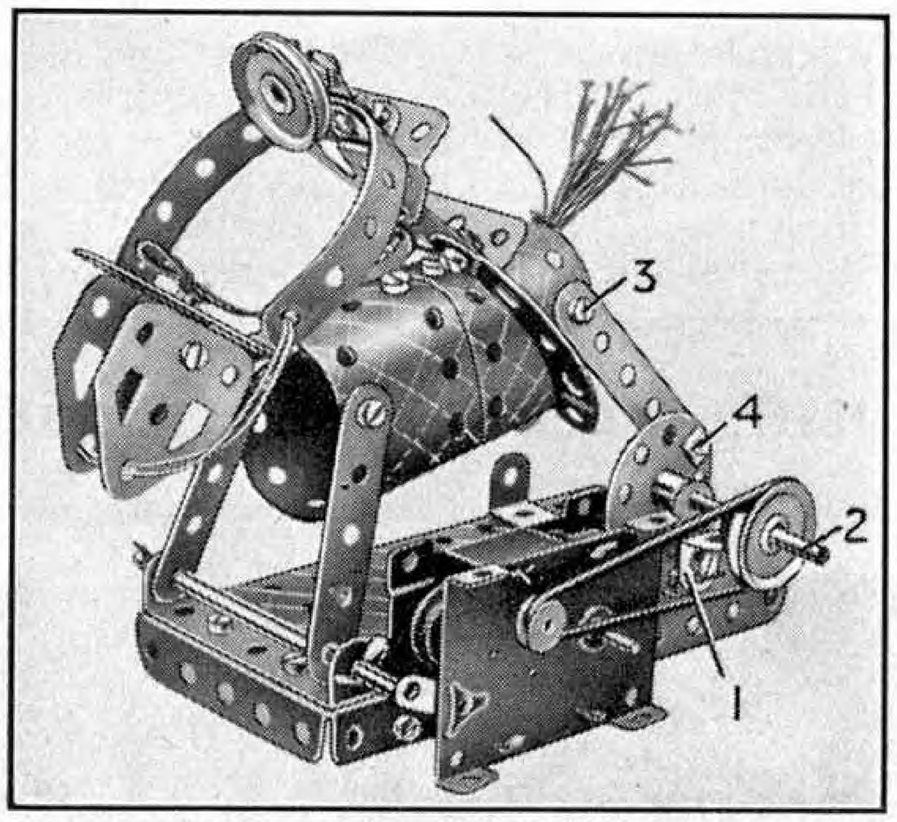


Fig. 5. A bucking broncho and rider. This novel toy is operated by a Magic Motor and only the parts in Outfit No. 1 are needed to build it.

The horse's body is made by bending two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates to form cylinders, and joining these together by a Flat Bracket and a $5\frac{1}{2}''$ Strip. The Strip is bent upward, and to it are fastened two Angle Brackets that in turn carry Flat Trunnions, which together make a respectable representation of a horse's head! One of the animal's rear legs is attached to its body by a bolt 3, on which two nuts are used, the second locking the first on which it is screwed down, and a second bolt 4, also with two nuts on it, connects the leg to the Bush Wheel.

The rider's body consists of two Trunnions and his legs of $2\frac{1}{2}''$ Curved Strips, which are adjusted so that while they prevent the rider from falling off his horse they allow him freedom to wobble about. His arms are formed by a $5\frac{1}{2}''$ Strip bent to shape and attached to his body by an Angle Bracket. His head is a 1″ Pulley fixed to a Flat Bracket by a $\frac{3}{8}''$ Bolt. The model is now complete except for the reins and the tail, which are made from Meccano Cord and arranged as shown.

Parts required to build the model bucking broncho: 2 of No. 1; 4 of No. 2; 3 of No. 10; 3 of No. 12; 1 of No. 16; 1 of No. 17; 2 of No. 22; 1 of No. 24; 2 of No. 35; 24 of No. 37; 5 of No. 37a; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 3 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 186a; 2 of No. 189; 1 *Magic* Motor (not included in Outfit).

Grand "Autumn" Model-Building Competition

Still Time to Win a Large Cheque

How would you like to come down to breakfast one morning and find a letter containing a cheque for £5/5/- by your plate? Think of all the things such a cheque would make possible for you! That new bicycle, camera or home cinematograph you have longed to possess could then be yours!

Such a delightful experience as this may await you if you make the best use of the next few weeks to build a Meccano model and enter it for the "Autumn" Model-Building Competition. Full details of this contest were announced in the October and November issues of the "*M.M.*," and as it will remain open until 31st December there is still time for those who have not yet done so to forward their entries.

"Autumn" Model-Building Competition

Closing Date: 31st December

First Prize, Cheque for £5/5/-.
Second Prize, Cheque for £3/3/-.
Third Prize, Cheque for £2/2/-.
Ten prizes of Meccano or Hornby goods value 10/6.
Consolation awards and Certificates of Merit.

A Great Opportunity to Win a Valuable Prize!

The "Autumn" competition is the first important contest of the season and we wish particularly to draw attention to the splendid cash prizes offered for the best models entered in it. A full list of the prizes appears in the panel on this page.

For the benefit of readers who are not familiar with the rules governing "*M.M.*" competitions we are again giving all details as fully as possible. This contest is what is known as a general one, that is, models entered may be of any kind whatever, including ships, bridges, locomotives, motor cars, machines of all kinds and any other subjects competitors can think of. Any size of Meccano Outfit or any number of parts can be used in building entries, but these must be assembled without aid from others. There is no age limit and model-builders living in any part of the world can compete on equal terms.

When the model is built all that is necessary is to obtain a photograph of it or, if this is not possible, a good drawing. Quite a small photograph will do, provided it is clear enough to show the details of the model, and neither photographs nor drawings need be prepared by the competitor himself if this is not convenient.

The competitor should then write his age, name and full address on the back of the photograph or drawing and enclose it, together with a brief description of the model, in an envelope addressed "*Autumn Model-Building Competition*, Meccano Ltd., Binns Road, Liverpool 13." Entries must be posted in time to reach this office not later than 31st December. Late entries will be disqualified.

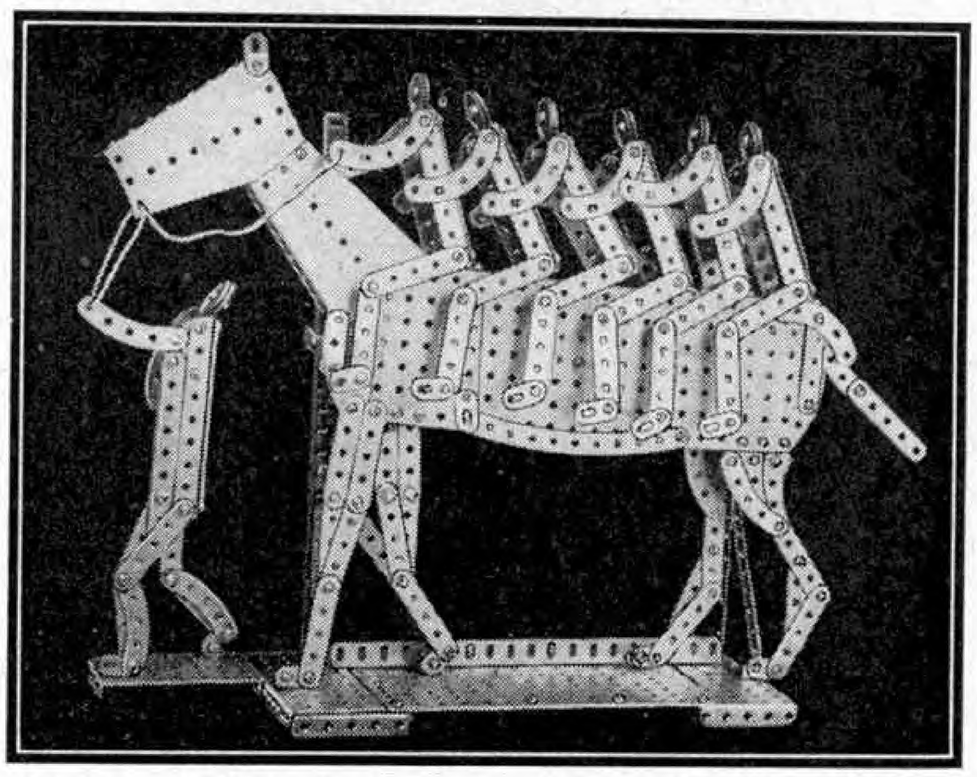
The prizes will be awarded to the senders of the models in which the best use is made of the Meccano parts of which they are built. Good sturdy construction, neat workmanship and the choice of a really interesting subject are the other main characteristics that are required in a model in order to win a prize.

It will be seen that a small model, skilfully designed and well-built, will stand just as good a chance of success as the largest and most intricate structure. This system of judging ensures fair treatment for each competitor, irrespective of the size of his Outfit. The age of each competitor also will be taken into consideration in assessing the merits of his work, so that the youngest boys can compete on equal terms with older hands.

"Amusing Models" Competition

From time to time we have illustrated in the "*M.M.*" amusing models of various kinds built from Meccano parts, and it is evident that there is considerable scope for light model-building of this type. We wish to encourage experiment in this direction and we are therefore arranging a special Christmas contest in which only models of a humorous nature may be entered. All that a competitor needs to do is to construct a simple model of any amusing subject that he can think of, and then take a photograph or make a drawing of it. The competitor should write his age, name and address on the back of the drawing or photograph and forward it to "*Amusing Models Competition*, Meccano Ltd., Binns Road, Liverpool 13." Any quantity or kind of parts may be used in building models, and entries will be accepted from competitors of all ages living in any part of the world.

The more amusing a model is the greater will be its chance of success, and an example of what is wanted is shown in the accompanying illustration. Models that can be set in motion naturally will attract the most attention, but it is not absolutely necessary that entries should be of this type.



"Uncle Tom Cobbley and all!" An example of a model suitable for entry in the "Amusing Models" Competition, details of which appear on this page.

The competition will be divided into two sections as follows: A, for competitors of all ages living in the British Isles; B, for competitors of all ages living Overseas. Section A will close on 31st December, but Section B will remain open until 28th February 1939, in order to allow readers in distant lands ample time in which to prepare and forward their entries.

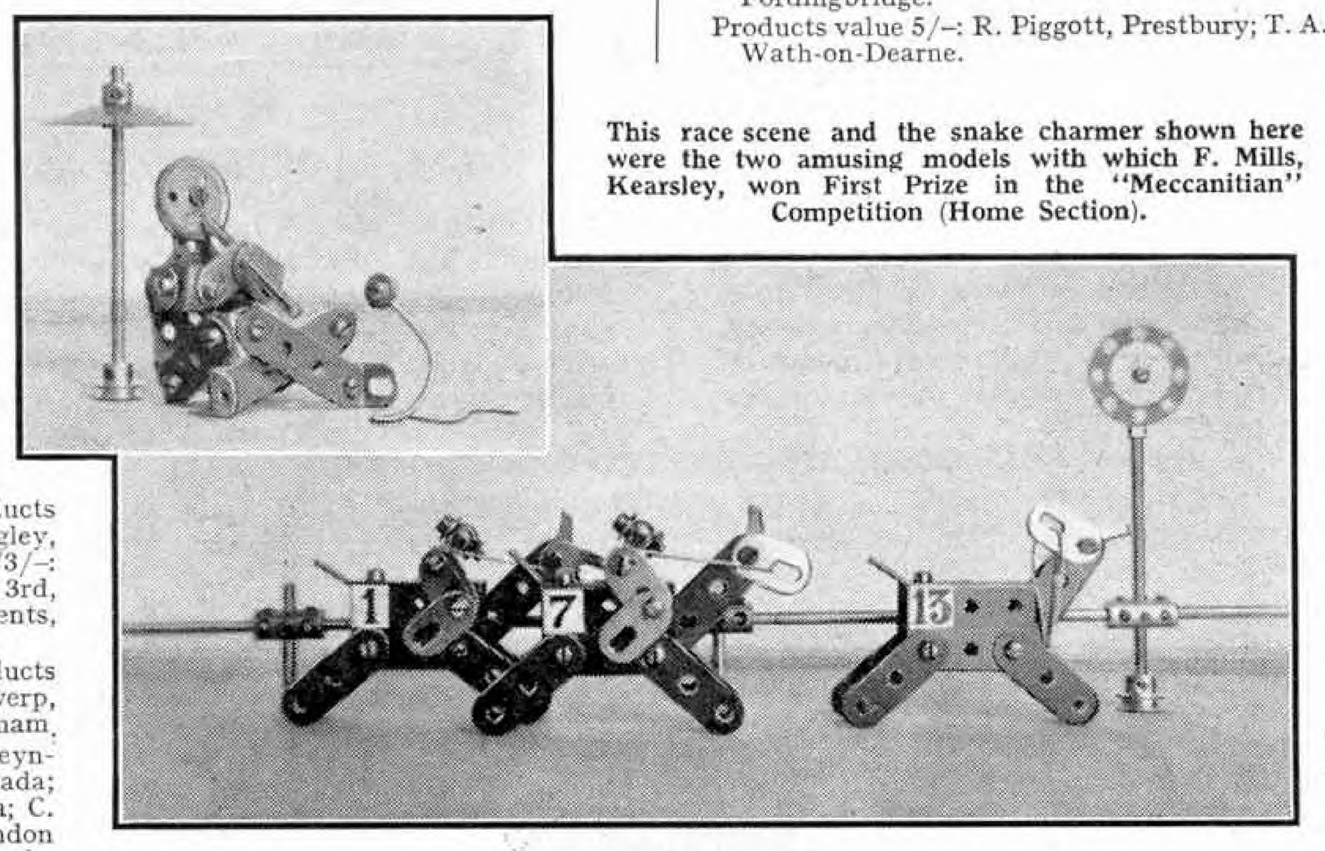
The following prizes will be awarded in each section for the most amusing and best built models received. First Prize, Meccano or Hornby products value £3/3/-; Second, products value £2/2/-; Third, products value £1/1/-. Five prizes of products value 10/6. There will also be consolation awards for models that closely approach prize-winning standard.

Model-Building Competition Results

By "Spanner"

Prize-Winners in the Grand "Summer" Contest

Model-builders all over the world have been waiting for the results of the great "Summer" Model-Building Competition, announced in the June, July and August issues of the *"M.M."* After the Contest closed for entries on 30th September, the judges immediately set to work to sort out the best models from the many hundreds of entries received. The task of deciding the prize-winners proved to be much more difficult than usual. The models generally were of so high a standard that the prize list was extended by the addition of two special Editor's prizes of £1/1/– each and more consolation prizes. The full list of prizes and Certificates is as follows:



This race scene and the snake charmer shown here were the two amusing models with which F. Mills, Kearsley, won First Prize in the "Meccanitian" Competition (Home Section).

1st Prize, Meccano or Hornby products value £5/5/–: J. Matthews, Fillongley, Coventry. 2nd, products value £3/3/–: H. Shorten, Winnipeg, Canada. 3rd, products value £2/2/–: E. Clements, Orpington, Kent.

Two Special Editor's Prizes of products value £1/1/–: J. Willems, Antwerp, Belgium; L. Willington, Birmingham.

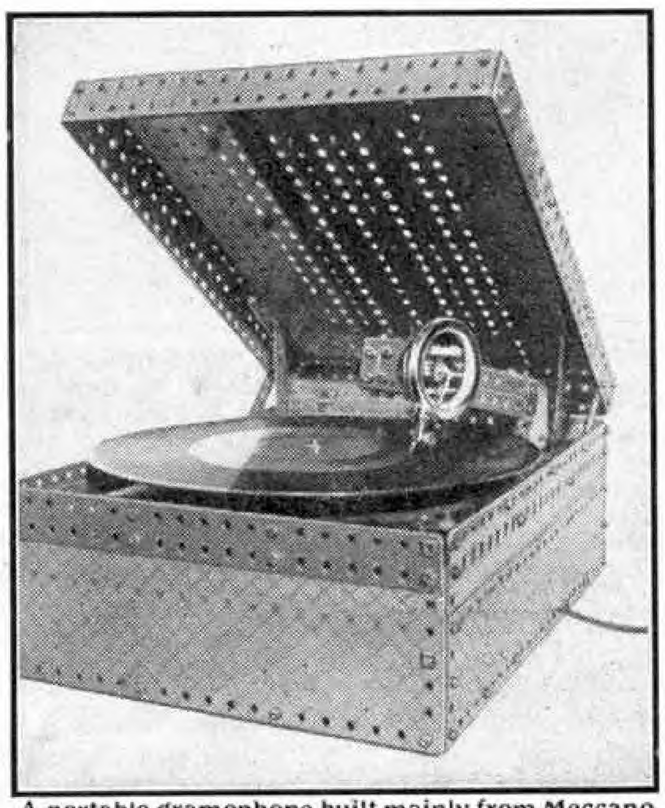
Products value 10/6: A. Aikman, Steyning; R. van Berkum, Fenwick, Canada; R. Borland, Peterborough, Canada; C. Brown, Bradford; J. Eyles, London W.13; K. Horn, Bramhope, nr. Leeds; C. Jones, Cheadle Hulme; A. Muff, Orari, Canterbury, New Zealand; J. Platero, Paris; W. Stainer, Bournemouth.

Products value 5/–: M. Ahmed, Shillong, Assam, India; G. Bruce, Heckmondwike; S. Chang, Shanghai; A. Cole, Broadchalk, Salisbury; I. Cross, Motherwell; F. Maker, Callington, Cornwall; R. Myburgh, Claremont, C.P., S. Africa; S. Reid, Aberdeen; C. Sharpe, Ilford; G. Shorland, Exeter.

Certificates of Merit: G. Allen, Wilmslow; S. Aston, Fairford, Glos.; P. Barker, Harrow; B. Belbin, Beckenham; P. Binns, Plymouth; D. Bower, London N.3; R. Carpenter, Pulborough; R. Clark, Bristol; R. Clayton, Wootton Bridge; A. Christmas, Ashford, Kent; R. Dent, Cambridge; A. Dick, Brighton; K. Duerden, Liverpool; N. Edis, Ramsgate; J. Fennell, London; M. Fogg, Bristol; N. Gottlob, Copenhagen; D. Harrison, London W.13; T. Hillman, Falmouth; D. Holden, Caversham, Berks.; A. Horsfall, Edinburgh; D. Hughes, Barking; N. Hughes, Liverpool; D. Hutt, Waikato, N. Zealand; W. Jackson, Hawick; G. Jones, Exeter; P. Keymel, Maastrich, Holland; S. Killip, Ellesmere Port; J. Little, Lr. Kingswood, Surrey; M. Macklem, Toronto; W. Millner, Inskip, nr. Preston; H. T. Murley, London N.8; A. Parfitt, New Malden; R. Parker, Swansea; J. Pearson, Heywood; B. Pickup, Spinkhill, nr. Sheffield; J. Pim, E. Cowes; A. Priest, Codnor, Derbys.; R. Read, Warminster; D. Scruby, Thornton Heath; A. Stanway, Stoke-on-Trent; J. Stedman, Marlow; P. Stuttaford, Winchester; R. Taylor, Swindon; M. Watts, Short Heath, nr. Wolverhampton; P. Willey, Exeter; M. Willoughby, St. Leonards; I. Wilson, St. Bees; R. Witham, Leeds.

The entries came from all parts of the world and I am pleased both with the number and the quality of the models submitted. Outstanding among those winning the chief prizes are a remarkably fine steam tractor and fire-engine, streamlined American and Canadian locomotives, a strikingly realistic model of an early English locomotive, a splendid travelling crane of a special type, printing machines, an old time mail coach, a road-grading machine and several fine ships and motor vehicles.

Unfortunately I am unable to describe these models individually this month, but readers will be glad to know that a selection of the best will be illustrated and described as fully as possible in a special article that will appear in next month's *"M.M."*



A portable gramophone built mainly from Meccano parts by J. Rowston, Orange, N.S.W.

"Meccanitian" Competition Results (Home and Overseas Sections)

In this competition, which was announced in the June issue of the *"M.M.,"* prizes were offered for original humorous models showing either single figures or groups of figures and animals in interesting situations or engaged in some humorous task.

The prize-winners are as follows:

Home Section.

1st Prize, Meccano or Hornby products value £2/2/–: F. Mills, Kearsley. 2nd, products value £1/1/–: J. Mann, Otley. 3rd, products value 10/6: G. W. Dredge, Fordingbridge.

Products value 5/–: R. Piggott, Prestbury; T. A. Stoker, Liverpool 19; H. Kenworthy, Wath-on-Dearne.

Overseas Section.

1st Prize, Meccano or Hornby products value £2/2/–: E. Tapper, South Perth, West Australia. 2nd, products value £1/1/–: G. E. Philpott, Rangiora, New Zealand. 3rd, products value 10/6: C. Laidlaw, Buenos Aires.

Products value 5/–: T. Barber, Capetown; P. Lewis, Toronto; W. Roberts, Melbourne.

F. Mills, Kearsley, who won the First Prize in the Home Section, submitted two models. These are the snake charmer and the horse race illustrated on this page, and readers will note the very fine effect.

"Originality" Competition Results (Overseas Section)

The "Originality" Competition was announced in the May issue of the *"M.M.,"* and the results in the Home Section were announced last month. The prize-winners in the Overseas Section are as follows:

1st Prize, Meccano or Hornby products value £3/3/–: J. Rowston, Orange, New South Wales. 2nd, products value £2/2/–: G. E. Philpott, Rangiora, N. Canterbury, New Zealand. 3rd, products value £1/1/–: L. Linder, Stockholm.

Products value 10/6: C. E. Laidlaw, Buenos Aires; G. Myburgh, Claremont, S. Africa; B. Macfarlane, Remuera, Auckland; F. Brown, Timaru, New Zealand; J. Stroebel, Johannesburg.

The most outstanding model was a portable gramophone built by J. Rowston, Orange, N.S.W. The model is illustrated on this page and I am assured that it will actually play either 10 in. or 12 in. records. Except for the tone arm unit, for which tin and rubber are used, it is constructed entirely from Meccano parts, and is provided with variable speed and volume controls and a mechanism that stops the Motor at the conclusion of each record. Another cleverly designed feature is that the tone arm is arranged to sink automatically into the body of the gramophone when the lid is lowered.

G. E. Philpott, Rangiora, New Zealand, was awarded Second Prize for a model of a box telephone of a type used extensively in the district around his home. The model is simply built and the construction is neat throughout.

A horse-drawn fire-engine was the subject of the model with which L. Linder, Stockholm, won the Third Prize. Instead of the usual ladder escape the engine is provided with a movable platform, which can be raised and lowered in a similar manner to the platform of a tower wagon. On this platform the firemen can be raised to a height sufficient to enable them to pour water from hoses through the windows of a burning building.

Among the models that were awarded prizes of goods value 10/6 the most original is a caricature of a Cheshire cat made up almost entirely from Strips. The model was built by C. E. Laidlaw, Buenos Aires, and might have been considerably improved by the provision of a motor or crank handle drive for the purpose of operating the animal's eyes and whiskers. If this had been done the model would undoubtedly have received a higher award.



A Merry Christmas!

A Merry Christmas to Guild and Club members throughout the world! It is always a pleasant task at this time of the year to send my good wishes to all those who have the interests of the Guild generally at heart, whether they pass this season of the year in Great Britain, where it *may* snow and give us traditional Christmas weather, or in Australia, South Africa, New Zealand or some other country where it is now summer, and bright sunshine and high temperatures accompany the turkey and plum pudding.

It is only natural that members of clubs should want other Meccano boys to join with them in the fun, and they cannot do better than keep a keen look out for recruits at this time of the year, when so many boys become Meccano or Hornby Train enthusiasts for the first time. The newcomers will profit from their introduction to club life at an early stage, and those who recruit them also will benefit, for *"More members means more fun."*

Meccano Club Comes of Age

On Christmas Eve the Exeter M.C. will celebrate its 21st birthday. When it was formed in 1917 under the guidance of Mr. M. C. Hodder, who has been Leader since 1920, there were only four members. To-day there are nearly 100, and the club is stronger than at any time in its history, with greater resources and a programme that includes a wonderful variety of activities in which modern boys delight.

Exeter M.C. members must be among the most diligent of model-builders, for I regularly receive formidable lists of models that have been built as part of the ordinary routine or for entry in contests. That these models possess quality is shown by the fact that many have won good prizes in *"M.M."* model-building contests, and in the number of models entered in these competitions the Exeter M.C. sets an example that I should like other clubs to follow on a larger scale.

The club has had its ups and downs. When for various reasons there has been a decline in membership the persistence and skill of Mr. Hodder and his faithful officials has revived its fortunes; at other times free play has been given to the enthusiasm of members themselves, with remarkably successful results. In recent years a number of Directors have taken over comparatively all club affairs, under Mr. Hodder's guidance, and every one of these Directors is a boy member of the club. Thus the great aim of developing initiative and resource is kept well in mind, and Mr. Hodder is never tired of telling me how wonderfully the plan works.

High lights in the story of the club have been many. It was affiliated with the Guild under its present name in 1925, and in the same year attention was turned to architectural model-building by the completion of a remarkably impressive model of Exeter Cathedral. In 1927 the club's football team won the Shield awarded in the League competition in which it was entered, reaching the final of the corresponding Cup competition in the following year.

Meccano Club Secretaries

No. 46. D. C. Lambert



D. C. Lambert is secretary of the Old Charlton M.C. This enterprising club was affiliated to the Guild in December 1931, and now carries out an excellent programme of Model-building, Debates, Lectures and Games, under the skilful guidance of Mr. S. Fish and Mr. F. W. Ambrose, Joint Leaders. "The Meccanic," a well-printed magazine issued monthly, gives club news and contains stories and other original contributions by members.

Merit Medallion Recommendations

I should be glad if Leaders would let me have their nominations for Merit Medallions for the present Session at the earliest possible moment. It takes a short time to have the names of the winners engraved on these awards, and adequate notice will enable me to send Medallions in good time for presentation at Exhibitions or Christmas Socials. I strongly recommend that Medallions should be handed over with a little ceremony on such occasions as these, as a form of public recognition of the good work of the members who have earned them.

Coming Events

December is a favourite time for Exhibitions as well as for Socials and parties, and this month I am able to give details of two that will be of special interest to Meccano boys in North London and Plymouth.

The first of these has been arranged by the Winchmore Hill Collegiate School M.C., for Friday and Saturday, 16th and 17th December. On each night Meccano and other models constructed by members of the club will be on view from 6 p.m. to 7.30 p.m. A model railway also will be in operation, and there will be a Handicrafts Stall where Christmas gifts made by club members will be on sale. In addition special Meccano models on loan from Headquarters will be displayed. Admission will be free and a cordial invitation is given to all who are interested in model-building and club work. Trolley-buses 629, 625 and 641 pass the School.

On each night this Exhibition will be followed by a variety show given by members of the Dramatic Section. Those who wish to be present should write to the secretary, F. J. Hearn, at the Collegiate School, Winchmore Hill, London N.21, for numbered programmes giving admission. These are 9d. each, and applications should state the number of seats required and which night is preferred.

The 12th Annual Exhibition of the Plymouth M.C. will be held in the Abbey Hall, Plymouth, on Saturday, 17th December. The display will be opened at 3 p.m. and will continue until 8 p.m. Models of all descriptions will be on view, with a working miniature railway. The charge for admission is 6d., children 3d.

Proposed Clubs

Attempts are being made to establish Meccano clubs in the following places, and boys interested should communicate with the promoters, whose names and addresses are given below:

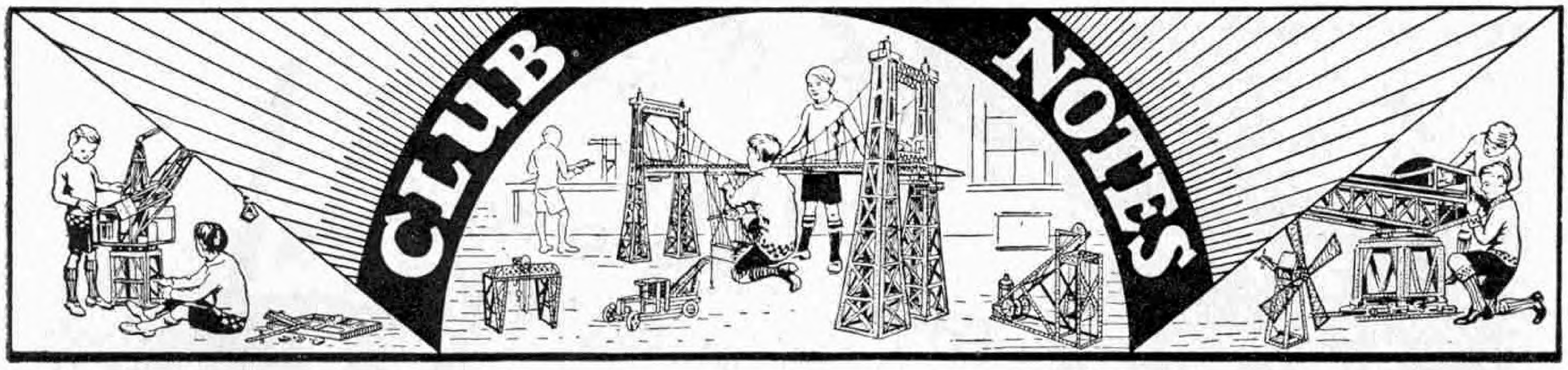
ILKESTON—R. Kirk, 142, Heanor Road, Ilkeston.

NEW ZEALAND—K. L. Moorman, 16, Fitzroy Street, Papatoetoe, Auckland.

HALIFAX—M. W. Bottomley, 6, Crane Terrace, Hopwood Lane.

HULL—J. King, 116, Carr Lane, Willerby, Hull.

RENFREW—A. Hunter, 2, Donaldson Drive, Renfrew.

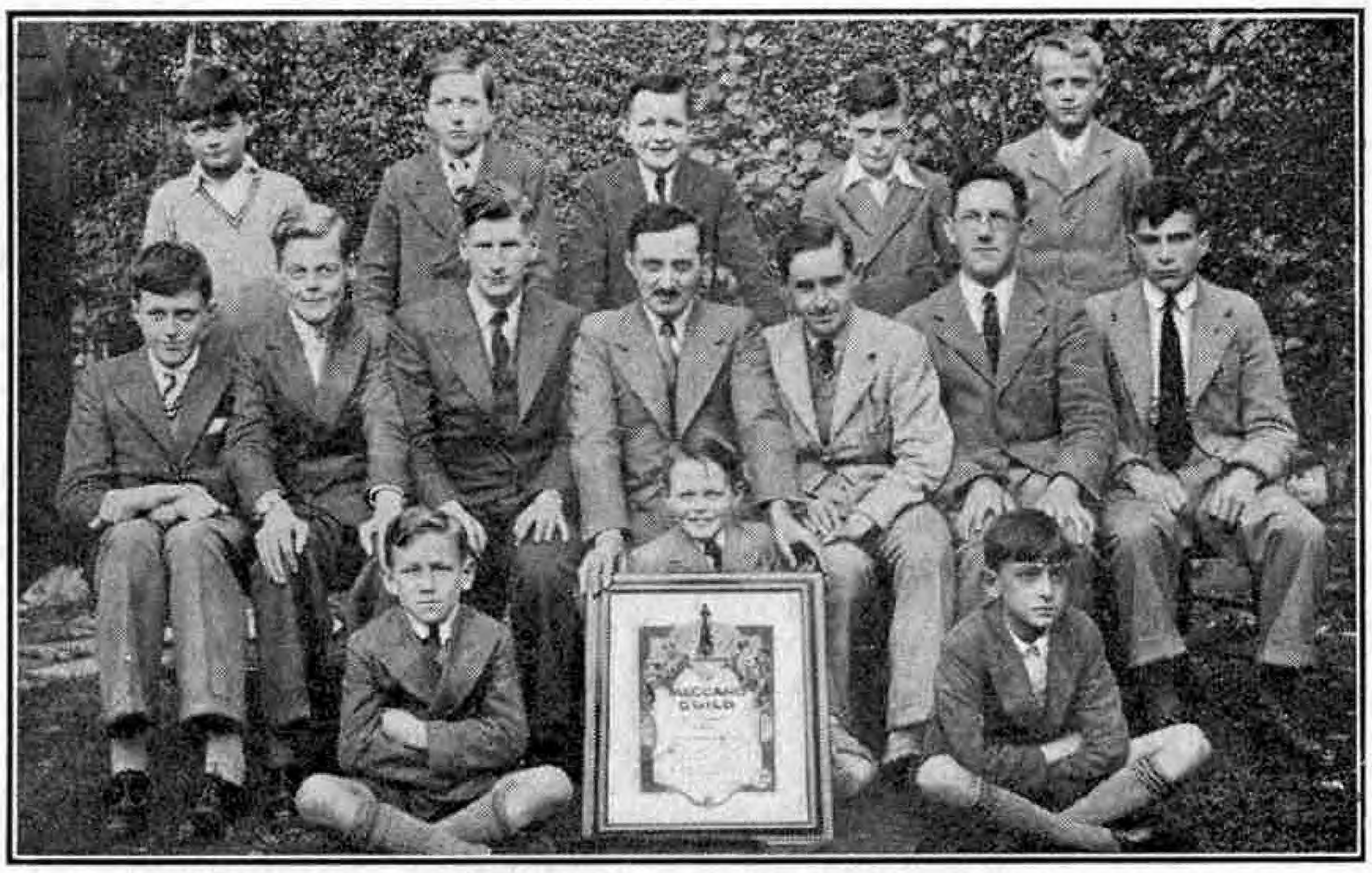


Sidvale (Sidmouth) M.C.—Model-building has been carried out at each of the weekly meetings. Contests in which models of particular subjects had to be entered have been held regularly, and many good lorries, cranes and ships have been built for these competitions. Club roll: 10. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

Islandmagee M.C.—At a recent meeting three groups were formed for model-building, Hornby railway working and quoits respectively. Half-an-hour was allotted to each, and the groups then exchanged occupations. Preparations for the forthcoming concert are nearing completion. Members will give a programme of songs and two sketches, in addition to various miscellaneous items. A Fretwork Section has been commenced, and the articles made will be on sale at the Exhibition to be held shortly. The formation of a Carpentry Section is under consideration. A Hallowe'en Party was greatly enjoyed, games and indoor fireworks occupying the time not devoted to eating. Recent meetings have ended with a sing-song, a very popular innovation. The secretary corresponds with officials of several Meccano clubs, and would be pleased to hear from others. Club roll: 18. *Secretary:* S. McCready, "Hillmount," Islandmagee, Co. Antrim.

Exeter M.C.—Some 30 new members were enrolled at the commencement of the Session, and many enjoyable meetings have been held. Attendances during September constituted a record for that month. The models built range from a motor car of the time of King Edward VII to an armoured car of today. The Football Section is very active, and there are now three teams connected with the club. Club roll: 55. *Secretary:* J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

Hornsea M.C.—Regular meetings have been held by all sections of the club. Lantern Lectures have been given on "*The Manufacture of Ink*," and other subjects. Games have been played on Social Evenings, Mahjong and Monopoly being firm favourites. Club roll: 16. *Secretary:* P. Richardson, "Summerleigh," Esplanade North, Hornsea, Yorkshire.



Members of the Hornsea Meccano Club with their Leader, Mr. R. W. Shooter, in the centre. On his right is P. Richardson, secretary. The Hornsea M.C. was affiliated in April 1930, and has enjoyed a very active career. The programme followed under the energetic and thoughtful guidance of Mr. Shooter is remarkable for its variety, including cinematograph shows, games and excursions in addition to model-building.

Middlesbrough M.C.—Good progress is being made by this club, which is divided into two sections, known as "*Nuts*" and "*Bolts*." Many interesting models were brought along to a Models Contest, in which entries could be made of any material. Club roll:. 20. *Secretary:* G. Brockhurst, 49, Heythrop Drive, Acklam, Middlesbrough.

Regent Street Central School (Heywood) M.C.—A Draughts match against the rest of the school resulted in a narrow win for the club. A very jolly Concert has been held, in addition to a Boxing Exhibition. A Darts match has been arranged, and several interesting Lantern Lectures are to be given. Club roll: 150. *Secretary:* L. Mathews, 2, James Street, Heywood.

Bexleyheath Central School M.C.—Meetings have been well attended, and the Meccano models built have been of high standard. Track working on the clockwork and electric Hornby layouts of the club has been of special interest to members. Club roll: 30. *Secretary:* D. Melville, 179, Rydal Drive, Bexleyheath.

Royds Hall Grammar School M.C.—An Exhibition has been held, and visitors complimented members on the excellent display. A Lantern Lecture has been arranged, and the L.M.S. film "*Building a Princess*" is to be shown as soon as the school projector is installed. Plans are being made for an Exhibition early in the New Year. Club roll: 32. *Secretary:* D. Livesey, 30, Heathfield Road, Golcar, nr. Huddersfield.

Old Charlton M.C.—At one meeting members gave two-minute Talks on any subject they chose, and a surprisingly high standard of interest was attained. Mr. Fish, Joint Leader, brought some of his many home-made Gauge O steam and clockwork model ocomotives to one meeting, and demonstrated their working for members. W. Fish gave a very interesting Talk on "*Eastleigh Locomotive Works*." One Model-building Evening has been devoted to models illustrating members' ideas of the transport of the future. The club has been divided into sections for competition purposes. The attractive programme for the future includes a Debate and a Lecture on "*Astronomy*." Club roll: 33. *Secretary:* D. Lambert, 23, Charlton Road, London S.E.7.

Bryntirion School M.C.—A more suitable clubroom has been obtained, and a new Leader and secretary have been elected, their predecessors having left the school. Extensive preparations are in hand for the Annual Exhibition, at which there will be a large display of Meccano models, many worked by steam engines. Club roll: 17. *Secretary:* E. S. Milner, Bryntirion School, Bridgend.

Barking M.C.—Members commenced the Winter Session with great enthusiasm, and this has been maintained. Model-building has been the chief feature of the programme, but Hornby Railway meetings also have proved attractive, and one evening was devoted to woodwork, all members helping to construct a wall rack for subscription cards. An interesting afternoon was spent at the Beckton Gas Works, East Ham. Club roll: 32. *Secretary:* F. K. Whitehead, 60, Devon Road, Barking.

Folkestone M.C.—Members are employed in the construction of stations and Meccano cranes for the railway layout of the associated H.R.C. Branch. A Fretwork Section has been formed. Four model cargo boats are being built. An Exhibition is to be held this month, and another in February. Model-building contests are being held regularly throughout the Winter. Club roll: 7. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone, Kent.

St. Stephens (Saltash) M.C.—The Club Exhibition is to be held shortly, and all members are busily engaged preparing for it. The Meccano Section have constructed a harmonograph, which worked very well when tested. A model stone-crusher and a Supermarine "Walrus" amphibian aeroplane are also under construction. In the Model Section an engine shed has been completed, and the "*Stirling Castle*" ship model is nearly finished. Good progress is being made with the construction of several other models. A very successful Dance has been held. Club roll: 11. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Mary Swanwick School (Chesterfield) M.C.—Regular meetings have been held, and Woodwork, Fretwork, Book-binding and Games have all featured in the programme. A Spelling Bee against a team of girls was narrowly lost. A very jolly club supper has been held. Club roll: 15. *Secretary:* F. Massey, 190, Holland Road, Old Whittington, Chesterfield.

Stretford Public Libraries M.C.—Well-constructed models built recently have included a windmill, an old-fashioned motor car, and a van complete with horses, in addition to a 36-hour alarm clock utilising the mechanism of an old clock. One amusing model 6 ft. in length reproduced the skeleton of a dinosaur, the detail being copied from a Museum skeleton. An audience of 77 attended a Lantern Lecture on "*A Holiday in Austria*." Another Lecture of "*British Railway Locomotives*" also was well attended. The Stamp Section have been very busy sorting and arranging a large number of stamps presented to them. The section have also devoted time to the collection of cigarette cards. Club roll: 36. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Friends' School (Saffron Walden) M.C.—Special attention has been given to the club's Hornby Railway. This has been electrified throughout and equipped with viaducts, suspension bridges and guard rails in special places, all built from Meccano. Club roll: 20. *Leader:* Mr. I. C. James, Friends' School, Saffron Walden.

St. Oswalds M.C.—A special effort is being made to attract recruits, and all who would like to join this progressive club should write to the Leader, Mr. W. Jaques, at the address given below. The programmes at recent meetings have included billiard matches, Spelling Bees and a Lecture on "*Locomotives*," and models built have been a gantry crane, a traction engine and an ordinary crane. Marks are awarded for the models constructed by members. A Mock Trial, a Meccano Motor trial and other attractive features are now being arranged. Club roll: 20. *Secretary:* J. F. Jaques, "El Molino," 5, Ingram Road, Thornton Heath.

AUSTRALIA

Maylands M.C.—Attractive programmes have been given on Visitors' Evenings, when the various Factions presented displays of models. These included a model farm, complete with harvester, windmill and wheat conveyor, a sugar refinery that illustrated the various stages between the cutting of the cane and white sugar production, and a military field of defence, with all modern equipment. The Mouth Organ Band has made regular appearances, both in public and at club meetings. Two Cycle Runs to the National Park were well attended and greatly enjoyed. A Lecture by the Leader on "*Steam*" gave much interesting information about locomotives and beam engines. Club roll: 36. *Secretary:* R. Le Cheminant, 60, Crawford Road, Maylands.

CANADA

Rosemount (Regina) M.C.—Regular meetings have been held, and model-building has been carried out with continued enthusiasm. Plans are being made for the construction of more ambitious models. *Secretary:* J. Watson, 974, Athol Street, Regina, Saskatchewan.

Y.M.C.A. Peterborough M.C.—The club is very active and weekly meetings have been well attended. In addition to ordinary activities Lectures and Talks have been given by guest speakers. A copy of the "*M.M.*" is always on hand for the use of members in planning and building new models. *Secretary:* R. Crocker, Y.M.C.A., Peterborough.

EGYPT

Sharkia Province M.C.—Several outings have been enjoyed. At Tall-abo-Yassin members were greatly interested in a number of ancient monuments discovered there recently. On another occasion a trip was made into the desert. Arrangements for the future include visits to a number of factories in Zagazig. Club roll: 7. *Secretary:* M. Z. A. Fuad, 6, Haret El Saaidah, Hafer El Gamea, Zagazig.



Join THESE WORLD-WIDE FELLOWSHIPS OF HAPPY BOYS

PRESIDENT:
MR. ROLAND G. HORNBY

MECCANO GUILD

THE MECCANO GUILD

BADGE OF MEMBERSHIP

HORNBY RAILWAY COMPANY

A real railway company with boy directors and officials

How to become a Member

Every boy who possesses a Hornby Train Set should join the Hornby Railway Company and thus become entitled to wear the badge of membership, which is beautifully enamelled in colours and has as its central feature a tiny representation of a train. All that he has to do is to fill in the application form—a copy of which is enclosed in every Train Set, or may be obtained from the Secretary, Hornby Railway Company, Binns Road, Liverpool 13—and return this, together with a remittance of 6d. (Overseas 10d.) to pay for the badge. Immediately on receipt of the completed form the applicant is enrolled as a member of this great organisation, and a handsome certificate to that effect is forwarded to him along with his badge.

The chief aim of the Company is to enable its members to get as much fun as possible from their miniature railways. This can best be done by helping them to make their layouts, and their railway operations generally, as realistic as possible, and competent railway experts on the staff at Headquarters are continuously engaged in advising members how to make the best use of the material at their disposal.

Join a Local Branch

The greatest fun is obtained from Hornby Trains by joining one of the many local Branches that have been formed in various parts of this and other countries. These Branches are composed of Hornby Train owners who meet together in order to carry out railway operations on a more extensive scale than is possible for a single individual. Every member should join a Branch, or if one does not exist in his neighbourhood, he should try to induce other enthusiasts to help him to found one.

To help and encourage Meccano boys

The Meccano Guild is an organisation for boys, formed with the object of making their lives brighter and happier—and of encouraging them in the pursuit of their studies and hobbies. All owners of Meccano Outfits are eligible for membership. Each member has the personal interest of the President and is entitled to the friendly advice and assistance of the Secretary. He wears the triangular Meccano Guild badge, beautifully enamelled in blue and white, and is presented with a handsome membership certificate printed in orange and black, and undertakes to promote the great objects of the Guild.

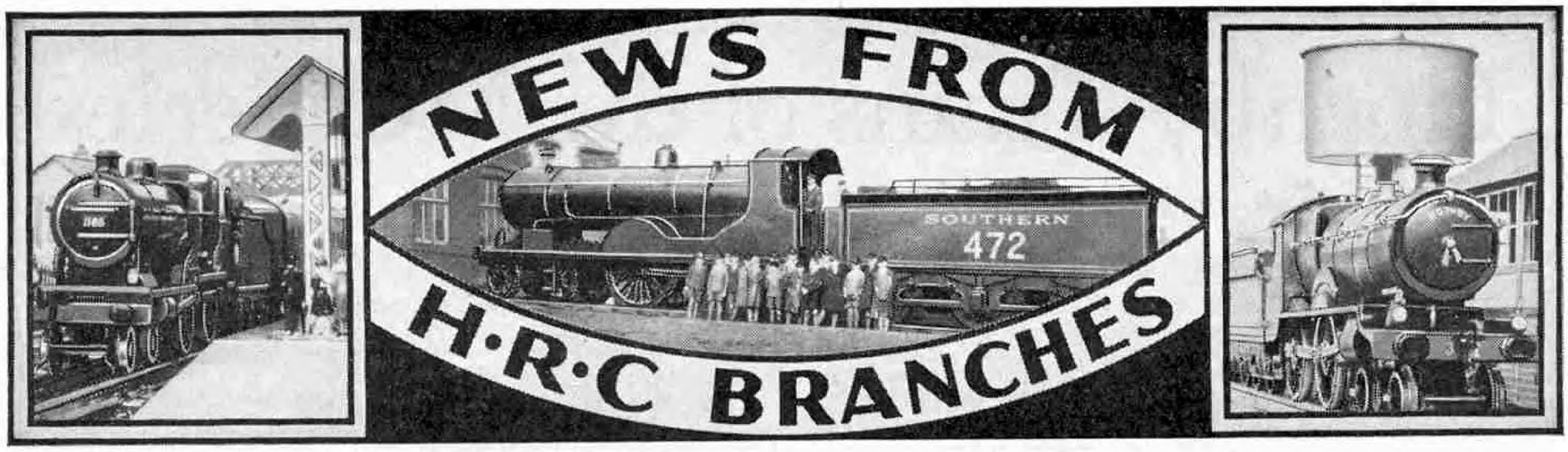
How to Join

All that is necessary to join the Guild is to fill up the form of application enclosed in all Outfits, and forward it to the Secretary, Meccano Guild, Binns Road, Liverpool 13, together with a remittance of 7d. (Overseas 1/–, Canada 25 cents) to pay for the badge. The applicant is then duly enrolled and his certificate and badge of membership are sent to him. If desired, application forms can be obtained from the Secretary.

Boys living overseas should write to one of the Meccano agents at the following addresses: CANADA: Meccano Ltd., 187-189, Church St., Toronto. AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W. NEW ZEALAND: Models Ltd., Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1. SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

Meccano Clubs

Meccano Clubs are founded and established by enthusiastic Meccano boys under the guidance of the Guild Secretary at Headquarters. Every Guild member should join one if possible, for only in association with other Meccano boys is he able to obtain the greatest fun from his hobby. If the nearest club is too far away for him to join, he should consider the possibility of forming a new club in his own district. A special booklet entitled **"How to Run a Meccano Club"** is now ready, and will be sent (post free) to any reader on receipt of 2d. in stamps.



Branch News

BURY ST. EDMUNDS.—Several members recently made an excursion to Thetford, where trains on the London-Norwich main line were watched. Track operations have been carried out regularly. A Debate has been held on the subject of *"Electricity v. Steam,"* and a Lecture dealt with *"G.W.R. Locomotives."* Several competitions have been held, including a very popular shunting contest, and a spelling bee was enjoyed. Two groups known as *"Engineers"* and *"Railwaymen"* have been formed, and inter-group competition will be introduced whenever possible. The first issue of the Branch magazine appeared in November. Secretary: T. S. West, 10, Crown Street, Bury St. Edmunds, Suffolk.

ACTON—New headquarters with two splendid rooms have been secured, and have been suitably decorated. A new baseboard has been constructed on which to lay the Branch track. Several new members have been enrolled, but there is room for more and the secretary would be pleased to hear from Hornby enthusiasts in the district. On the third of the series of *"Evening Tours"* members made a round trip to Uxbridge. It is proposed to form a Library and issue a magazine, and a Meccano Section is to be formed. Secretary: S. W. Simmons, 7, Alfred Road, London W.3.

PLYMOUTH.—At the Annual General Meeting very satisfactory reports were given of all branches of activity. The usual programme has been followed at all meetings, and several new members have been enrolled. The "Richard Tubb" Cup is now to be awarded annually to the member enrolling the greatest number of recruits in the Branch year. A new notice board and an interesting membership graph have been presented. A Cinematograph Show and a Lantern Lecture held recently proved particularly enjoyable. Secretary: A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

BARKING.—Splendid track meetings have been held, at one of which a large continuous layout was arranged and successfully operated. On another evening a continuous track was worked, and special attention was paid to locomotive timing. Secretary: F. K. Whitehead, 60, Devon Road, Barking, Essex.

BEDFORD.—The Branch has moved to larger and more suitable quarters with three rooms, to which members have access at all times. All equipment has been transferred and re-arranged, trestles and baseboard have been set up, and the track has been relaid. The Branch's comprehensive lighting installation and remote control for points and signals has been added, and suitable scenic effects have been provided. It is hoped to exchange visits with the Northampton Branch. Secretary: A. W. R. Coomber, 33, St. Michael's Road, Bedford.



A group of members of the Acton H.R.C. Branch No. 308. Mr. J. H. Statham, Chairman, is seated in the centre with S. W. Simmons, secretary, on his right, holding the Branch Incorporation Certificate, granted in June 1936. The Branch recently moved into new quarters, with two good rooms that have been appropriately decorated, and there is now room for more members.

SOUTH BIRMINGHAM MODEL RAILWAY CLUB.—The permanent layout has been re-designed and the electrical control equipment completely reorganised. This has resulted in improved running, and new timetables are being drawn up. New rolling stock is being built. H.R.C. enthusiasts wishing to see the layout in operation will be welcome as visitors during the week commencing 5th December. Secretary: Mr. E. Sharp, 156, All Saints Road; Kings Heath, Birmingham 14.

BARNARD CASTLE SCHOOL.—Attendances have been excellent at all meetings. Two new locomotives, a Hornby *"Flying Scotsman"* and a tank engine, are now available for club use. The track for the forthcoming Exhibition has been laid down, and train working rehearsed. Colour-light signals have been introduced for this occasion, and experiments are being made with scenic effects. Extensive use will be made of Dinky Toys on the Exhibition layout. Secretary: K. R. Southern, The School, Barnard Castle.

ABBEY (BURY ST. EDMUNDS).—The Branch track has been laid down to a new design, and timetables are being revised accordingly. Members frequently spend interesting evenings carrying out track operations on the extensive permanent layout of Mr. D. W. Palmer, a member who has kindly granted the club permission to use it. The track on this layout was recently electrified, and a replica of the *"Brighton Belle"* introduced, together with a new station and rolling stock. Regular competitions have been held, including a popular "Puzzle Corner." Secretary: M. D. Forster, 2, Crown Street, Bury St. Edmunds.

Proposed Branches

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below.

MILNGAVIE—W. Norris, "Bressay," 11, South Mains Road, Milngavie, nr. Glasgow.

PINNER—J. R. Burden, "Laneham," 71, Paines Lane.

LONDON—E. S. Bithrey, 72, Brownlow Road, New Southgate, N.11.

LEVEN—I. Stewart, "Niaroo," Largo Road, Leven, Fife.

SALTBURN-BY-THE-SEA—T. Jones, "Delamere," Laurel Road, Saltburn, Yorks.

WESTCLIFF-ON-SEA—J. Hook, 298, Southbourne Grove.

STOCKPORT—D. Orr, 66, Caistor Street, Brinnington.

LIVERPOOL—F. Murphy, 2, Stuart Road, Bootle, Liverpool 20.

KING'S LYNN—B. Gilchrist, "Holmwood," 296, Wootton Road, Gaywood.

GLASGOW—R. McKenzie, 15, Gelston Street, Sandyhills, Glasgow E.2.

ROMILEY—R. Browning, 84, Compstall Road, Romiley, Cheshire.

WALLINGTON—R. J. Davis, "Bincleaves," Woodmansterne Lane, Wallington, Surrey.

Branches Recently Incorporated

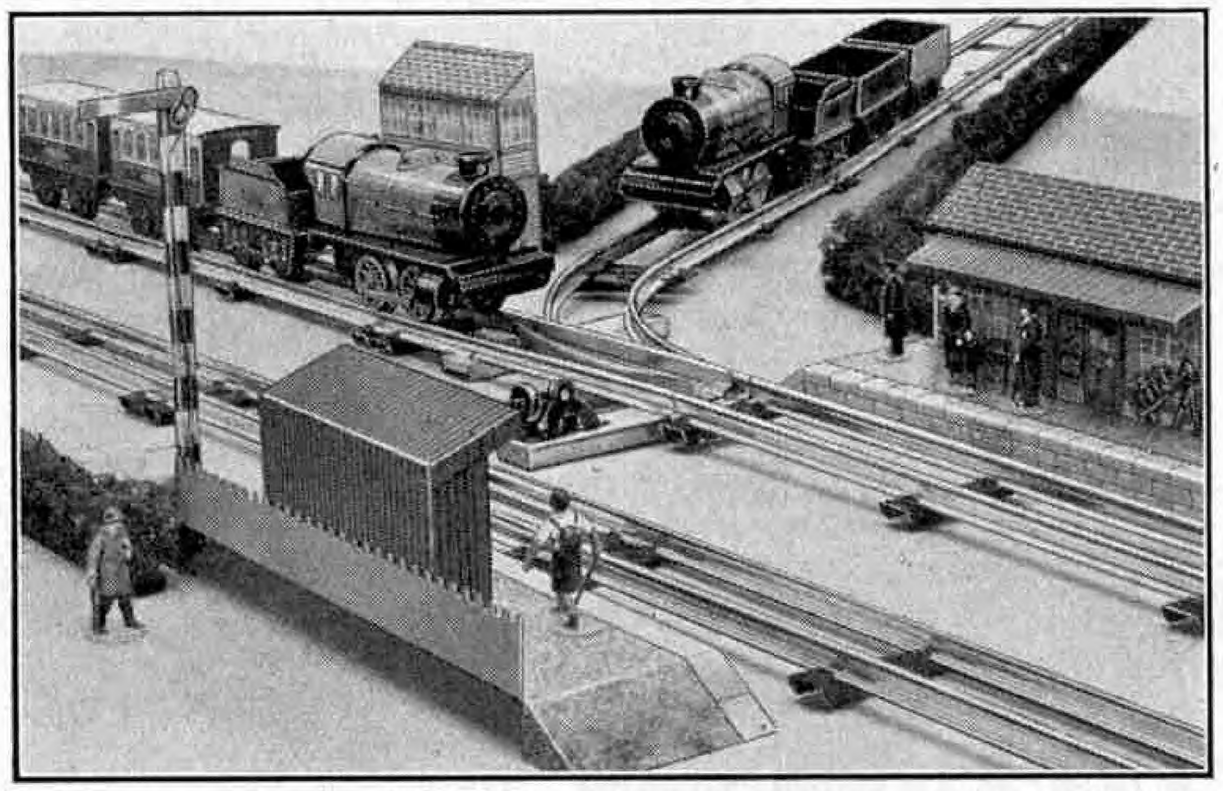
357. LONDON—Mr. W. C. Cook, 22, Elmhurst Drive, South Woodford, E.18.

358. HAVANT—Mr. T. W. Marshall, "Springfield," Rectory Road, Havant, Hants.

Hornby Trains of the MO Series

Railway Fun for Beginners

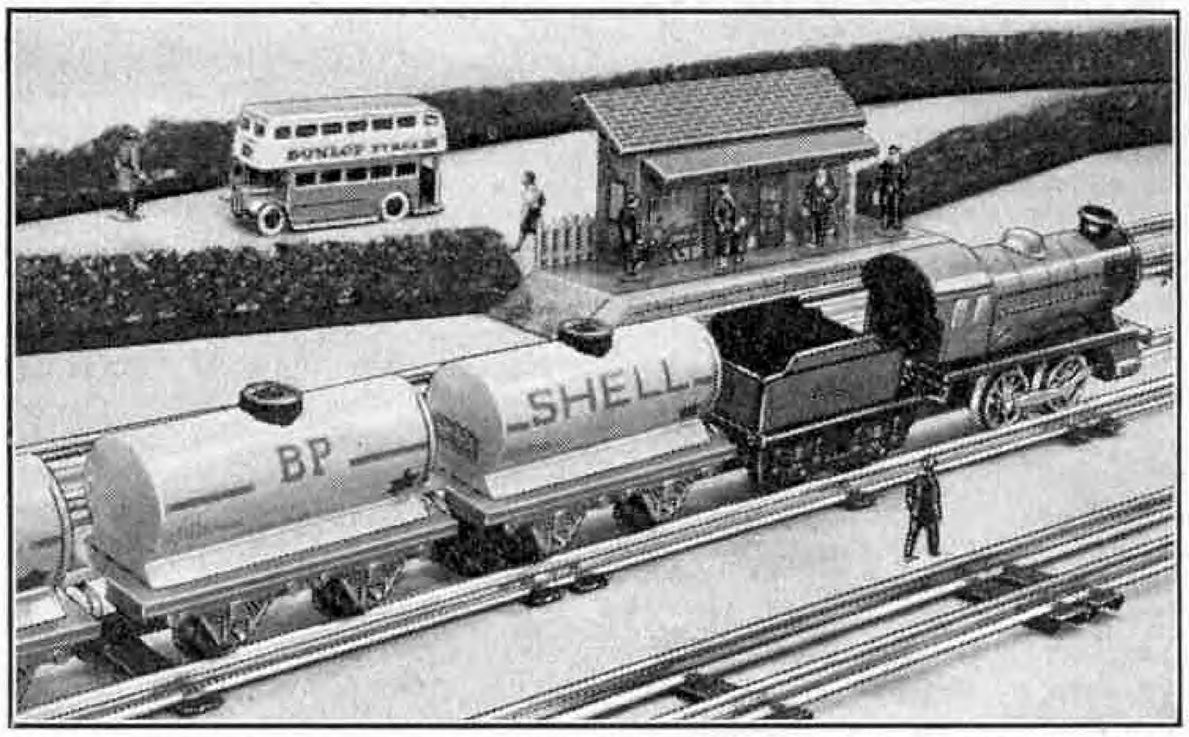
HORNBY Railways, like all other good things, must have a beginning, and for the younger boy who is making his first acquaintance with the joys of running a miniature railway the trains and equipment of the MO Series are ideal. The Trains themselves are reliable, and simple and easy to deal with, and the layouts do not take up too much room, for the Curved Rails have a radius of 9 in., and thus the simplest type of layout, a plain circle, can be accommodated in a space 2 ft. square. The MO Series Rails include both Straights and Curves, and for use with them there are corresponding Points, with the aid of which a plain circle or oval can be developed in a real railway-like manner into very attractive layouts such as those shown in Figs. 1 to 24 in the booklet *"Hornby Layouts —100 Suggestions"* (4½d. post free from Meccano Ltd., Liverpool). Another great advantage is that when the time comes to extend the railway, and to embark on more ambitious schemes, the M Series material can quite well be used in conjunction with that of a Gauge O Hornby Railway.



An interesting scene on an MO layout. The goods train from the branch line is waiting while the passenger train runs over the points towards the station.

Sufficient rails to form a complete circle are included in each of the MO Train Sets, and in the case of the MO Mixed Goods Train Set an oval track can be assembled. A Brake Rail fitted with a trip arrangement also is included, and the trip can be set to engage with the brake mechanism on the engine and so bring the train to a stand automatically. The ability to stop the train in this manner when required adds greatly to the fun of operation.

The smallest outfits are the MO Goods and the MO Passenger Train Sets. Each of these includes an attractive Locomotive and Tender, the engine being provided with outside cylinders and connecting rods, and fitted with a clockwork motor of remarkable power and length of run for its size. Two Pullman Coaches are included in the Passenger Set, and in the Goods Set there are two Open Wagons. With either of these Sets the operation of a train service on a fascinating little railway can be commenced, and when the layout is extended, and perhaps an additional train is obtained, really fascinating working of passenger and goods trains in conjunction with one another can be practised, as shown in the upper illustration on this page.



A tank wagon train made up of MO Petrol Tanks. Hornby Hedging and Meccano Dinky Toys add to the effectiveness of this scene.

The MO Mixed Goods Train Set is a more ambitious affair, with straight as well as curved rails in it so that an oval track can be formed. The locomotive is the same as in the smaller Outfit, but there are three wagons, each of a distinctive type. One is a Side-tipping Wagon, the body of which can be made to discharge its load to either side of the track if required; the others are a Rotary Tipping Wagon, the body of which can be revolved and made to tip to almost any point, and a Tank Wagon. The Tipping Wagons are great fun, for they discharge their loads in realistic style with very little handling. They can be loaded with the Hornby Coal that has been specially introduced for loading Hornby Wagons, or household commodities such as dried peas, or even rice, can be employed. The Tank Wagon too is a splendid little model, the design of which is based on the large capacity tanks used on real railways for the conveyance of "Shell–B.P." petrol.

Although not described as MO Train Sets, the No. O *"Silver Jubilee"* and No. O Streamlined Train Sets can be considered together with the other components that we have mentioned, as the engines have the same clockwork mechanisms, and 9 in. radius Rails are included in the Sets. The *"Silver Jubilee"* Train represents the famous L.N.E.R. flyer, which was the first completely streamlined train to be operated in this country. The outline of the engine and tender are based on the well-known locomotive No. 2509 *"Silver Link,"* and the train itself has the same attractive silver appearance as the real L.N.E.R. train. The No. O Streamlined Trains are of similar construction, but are finished in attractive two-colour schemes, one being maroon and cream and the other light and dark green.

There is a special series of Accessories for use with MO Trains, so that a complete self-contained system can be assembled using these different components. For example the M Station Set consists of seven items, the most important of which is the Station that appears in both illustrations on this page. This is a realistic little structure, attractively tinprinted to represent on a small scale the main features of the average station. The Wayside Station is less elaborate and resembles the usual halt of real practice. It is made to represent a built-up platform with a wooden shelter in which there is a seat for the benefit of waiting passengers. The Set includes also two M Telegraph Poles No. 1, a necessary and characteristic lineside accessory. There is also in this Series the M Telegraph Pole No. 2, which is similar to No. 1 but has a taller post. This item is not included in the Set, but can be bought separately.

Signals of course are necessary for the beginner and even the smallest railway enthusiast would never dream of running a railway without them. The Signals in the M Series are simple, but quite effective in appearance. They have semaphores operated by means of the wire connecting rod, the lower end of which is formed to move in a slot in the post which provides for positive "danger" and "line clear" positions. The M Signal Box represents the standard brick basement and wooden upper storey type of cabin so familiar on real railways. Its red bricks and cream woodwork add a touch of colour to the lineside.

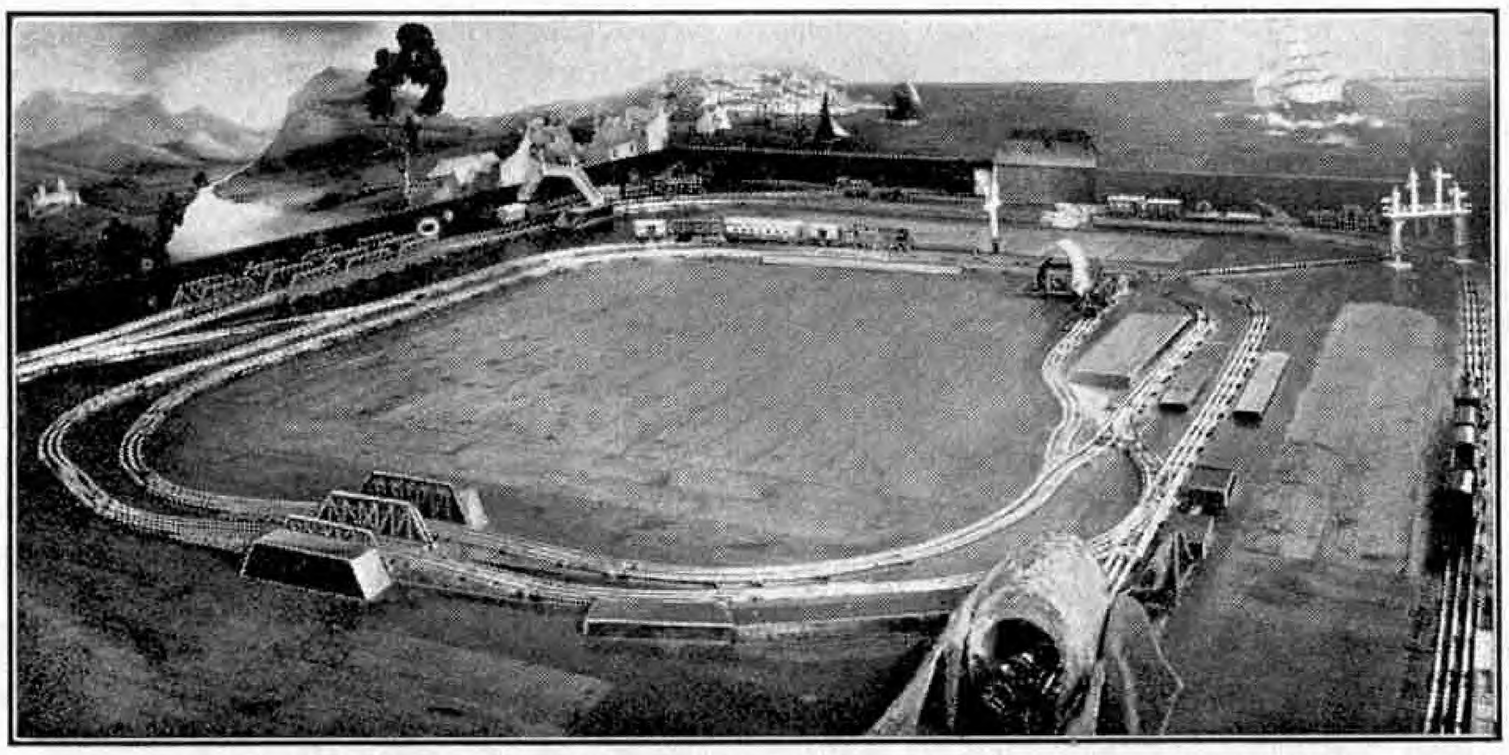
A track accessory that adds to the interest of a system is the M Level Crossing. This is suitable for single track layouts only. The gates are permanently open for the passage of trains, but the Crossing should certainly be included in M Series layouts whenever possible for the sake of its spectacular effect.

A Hornby Railway in a School

The "Engine Room" of Norfolk House

THE miniature railway system described on this page is installed in what is known as the "Engine Room" at Norfolk House Preparatory School, Beaconsfield. The system was commenced some years ago by the Headmaster, Mr. C. M. Glover, M.A., LL.B., to whom we are indebted for our photograph and the details given here, the information having been written by two of the School prefects, G. D. H. Shephard and E. R. Evans. At first the railway was simply a plain oval track consisting of a few straight lengths of rail with 1 ft. radius curves, but there are now almost 100 yds. of track forming a complete and elaborate system.

The laying down of the first track proved a great attraction and stimulated the interest of the boys, many of whom contributed rails and accessories from their own collections of miniature railway material. In order to supplement the buildings, and to provide realistic lineside features, platforms, viaducts and other similar items were constructed by the boys themselves during carpentry classes; and soon the railway had grown to such an extent all round the room that the whole layout had to be replanned by Mr. Glover in order to make the best use of the amount of material available. The track was then installed permanently by being screwed down to the floor. So far trains had been run exclusively by clockwork locomotives. The next step was to electrify the line, and in this work Mr. Glover was ably helped by the Assistant Master, Mr. O. J. Smith. Within a few weeks the whole of the layout was provided with electric conductor rails, except for a central section used only for slow freight trains. Current is supplied to the track by means of a Meccano Transformer, which is close to the track but concealed beneath a scenic covering.



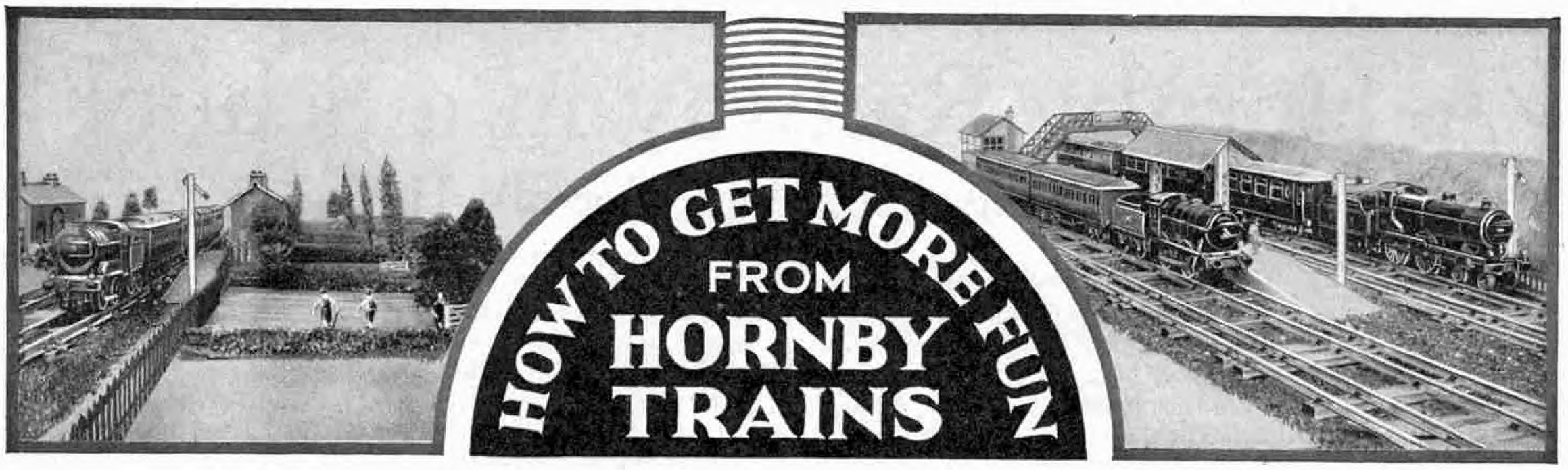
An interesting view of the layout in the "Engine Room" at Norfolk House Preparatory School. This system was commenced some years ago by the Headmaster, Mr. C. M. Glover, M.A., LL.B., to whom we are indebted for the description. The photograph was specially taken by Mr. Cecil Drake, Gerrard's Cross.

The layout now consists of two continuous main line systems, one inside the other. A loop line reserved for express traffic only forms part of the outer system, and the inner system, on which less important traffic is operated, is made up of two running tracks, each of which is carried over a separate viaduct at one point, as can be seen from the illustration. Connections are arranged between the two systems at two different points; one connecting line is situated near the main station and the other is carried through a tunnel and a cutting of varying depth. An interesting point is that in order to avoid any possibility of collisions, which might occur when there is a large number of operators at work, traffic is usually worked in one direction only on all lines. With this in mind the connections between the individual tracks and between the inner and outer systems have been arranged with facing points; thus trains can be run round each line in turn and can also be brought back to the particular track on which they started.

Running traffic in one direction only is quite a successful method of operating a system of this kind, and it can be applied equally well to smaller continuous layouts. When several clockwork locomotives are in use on a layout operated "from the inside" it has the advantage that the winding spindles can all be on the inner side of the track, as there is no turning of the engines for return journeys.

The effective character of the whole system can be judged from our illustration. Many Hornby railway owners no doubt will be envious of the very fine scenic surroundings provided for the line. These were specially painted for the railway by the School Drawing Mistress, Miss C. Engel. The variety of features in the scenery adds greatly to the realism. The landscape includes typical countryside with hills in the background, and there is a river flowing towards a point where the outer main lines of the railway are carried over a series of viaducts. A fishing village and harbour provide a picturesque connection between land and marine elements in the scenery, for there is a fine stretch of sea on which various sailing craft appear. Scenes of a commercial character also are depicted, and for these Southampton Docks have formed the inspiration. R.M.S. *"Queen Mary"* is shown in the King George V Dock, and other vessels, liners and cargo ships, appear to be near or alongside a most realistic quay, which is complete with roadways, railways and transhipment sheds.

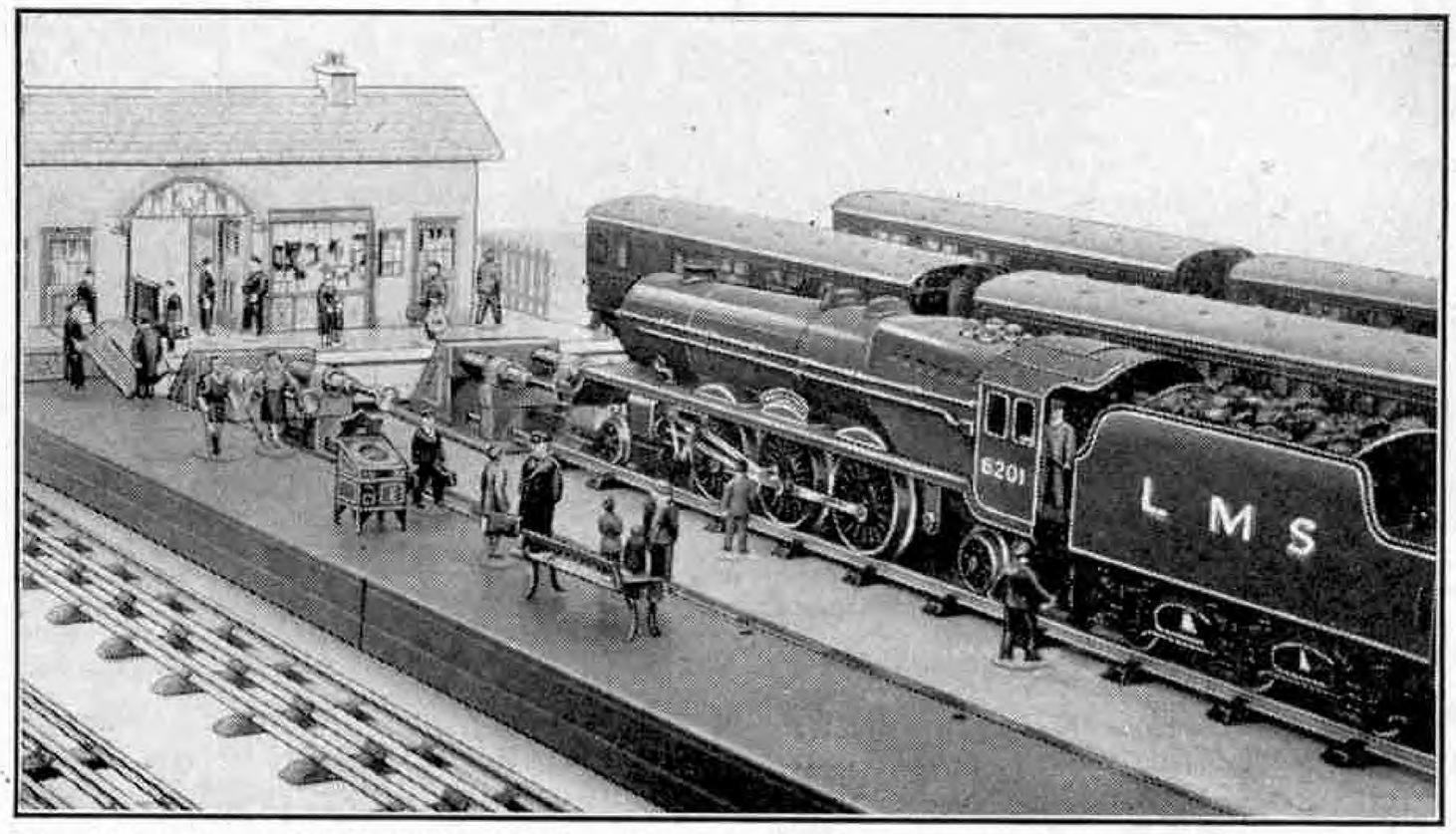
Train services are worked by locomotives of various types, both electric and clockwork. The electrically-operated equipment includes one of the realistic Hornby Metropolitan Locomotives and several of the clockwork engines are of the No. 2 Special type. The system boasts a breakdown train hauled by a No. 2 Special Tank. Rolling stock from Hornby Pullmans to open wagons is available and there are numerous Hornby Signals and Footbridges and a No. 2 Engine Shed.



STATION WORKING ON HORNBY RAILWAYS

STATIONS are necessary to give an air of reality to a model railway layout, and from time to time we have shown how to arrange Hornby railways with this in mind. It is essential also to give "life" to them and their surroundings by means of the miniature figures included in the series of Meccano Dinky Toys, and the use of these splendid miniatures was referred to in some detail in these pages last month. Even though we place stations properly, and provide them with staff and miniature passengers, there is still a considerable lack of realism if we do not use these accessories properly, and this month we deal with actual operations on and near them.

One of the first things to be borne in mind is that stations are places where trains stop to take up and set down passengers and goods. Sometimes on a layout the only stations that appear to be recognised for these purposes are the terminals! Intermediate stations may be provided, but they are frequently neglected in the matter of train operations. It is far more interesting if a train makes stops at such stations, and if the stations themselves are worked in a similar manner to that followed in actual practice.



A terminus made up of the Hornby No. 4 Station and lengths of Passenger Platform. Station working is an important part of miniature railway operation, and some useful hints on it are given in this article.

Before the commencement of the run of a miniature express there are various preparations to be attended to that can form part of station working. On systems where plenty of space is available coaches can be stored in sidings, but it is frequently necessary to accommodate empty trains at the platforms of the terminals when the layout is not in use. Whichever practice is followed it is necessary to see that the train is made up correctly. A miniature express—and almost every Hornby Railway boasts its favourite flyer—should consist of corridor stock, either Pullman, Saloon or ordinary Corridor Coaches according to the particular service. The "platform inspector" should see that the corridor connections are correctly coupled up and that the destination boards, of which such a fascinating variety is now available in the Hornby Series, are in position in their brackets.

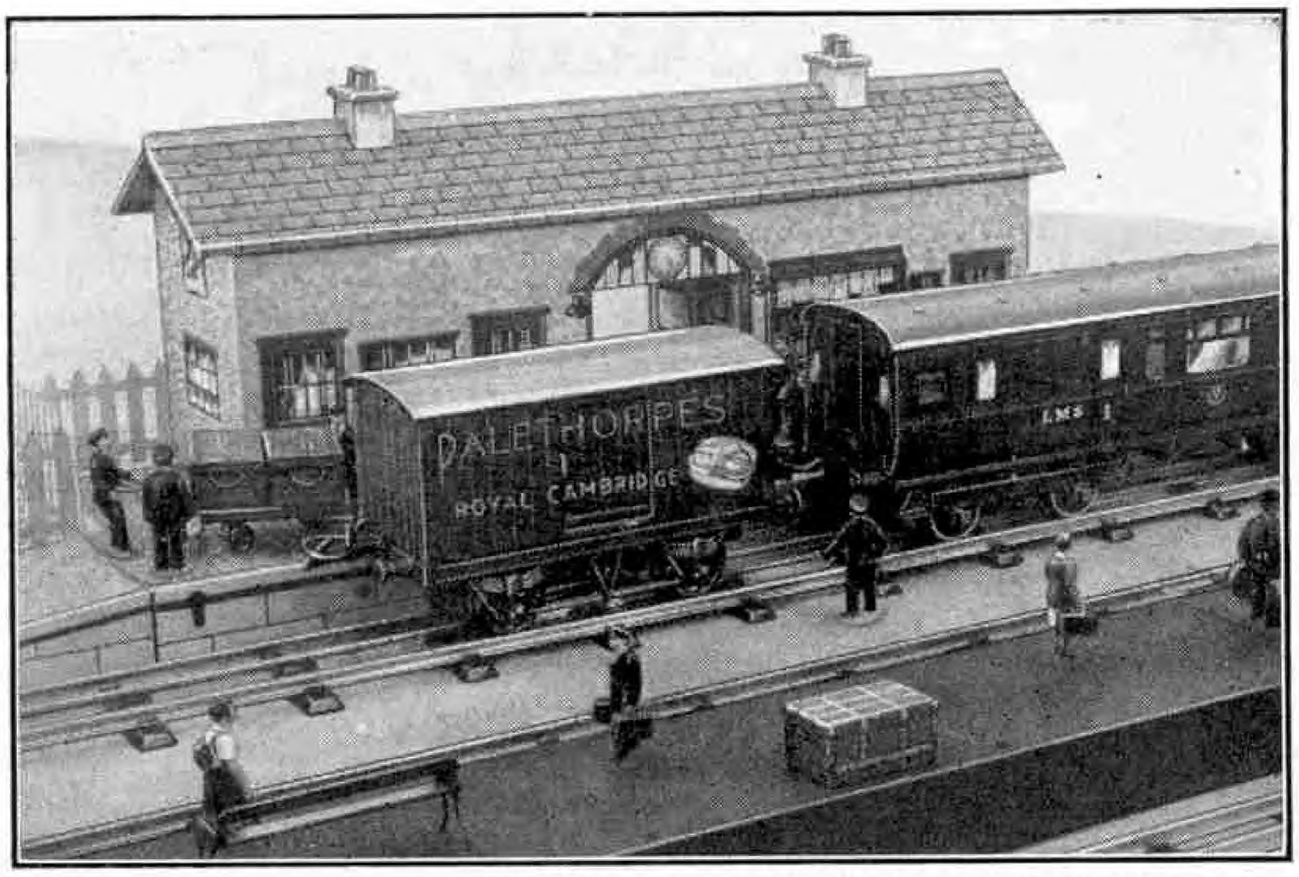
Another point is that a tail-lamp should be provided whenever a train consists of vehicles that are fitted with lamp brackets. The correct "lamping" of various coaches can be made quite an interesting operation. The lower illustration on the next page shows how a system that is practiced at various stations can be reproduced in miniature on a Hornby railway. A platform barrow, such as that contained in the Railway Accessories Set No. 2, is loaded with a number of tail-lamps which we will presume are trimmed and ready to be placed on the brackets of the coaches. The lamps that have already done duty on one journey are taken off and exchanged with fresh ones from the barrow. This is a fascinating and simple job that will appeal strongly to the younger members of the railway staff.

When a train calls at an intermediate station quite a number of operations may require attention. The luggage and milk cans that are included in Railway Accessories Sets Nos. 1 and 3 respectively should be arranged on the platform exactly opposite to where the luggage doors of the guard's van or composite coach will be when the train stops. Very orderly arrangement in this way gives a far more realistic impression than is possible when, as often happens, they are simply dumped anywhere on the platform and left there. Some boys make a practice of the actual loading of these items into vehicles that have opening doors. For instance, a Hornby No. 2 Luggage Van could be attached to a train that is required to convey traffic of this kind. This is a splendid vehicle for the job, for its pair of wide opening doors allow loading and unloading operations to be carried out very easily. When used in this manner it can be considered more as a parcel van of the type used in passenger service than as an ordinary freight vehicle.

A feature of station working which appeals to every

miniature railway operator, is the practice of replenishing the water supply of the locomotive at an intermediate stop. At the end of many station platforms a water tank or column is found and it is always a fascinating sight to watch the enginemen attending to the refilling of the tanks. A Water Tank placed at the lower end of the ramp of a Hornby Station platform will add to the realistic appearance of the Station and it requires quite an amount of judgment on the part of the operator to stop the train so that the tender of the locomotive is immediately abreast of the Tank.

An interesting feature of station working that can be reproduced in the operation of a miniature station is the handling of freight or parcels traffic originating locally. This may require collection by means of the "Company's" road motor service and it may be necessary to attach a special vehicle to a particular train for the conveyance of the traffic by rail. Such traffic may be dealt with by means of freight trains and in the case of many items, such as bricks, coal, and stone the ordinary pick-up goods service can be made use of to collect the vehicles concerned. The provision of the wagons required, their loading and their collection by a suitable freight train all falls to the lot of the station operator, who in this case combines the offices of controller, stationmaster, goods agent, loading foreman, shunter and train crew!



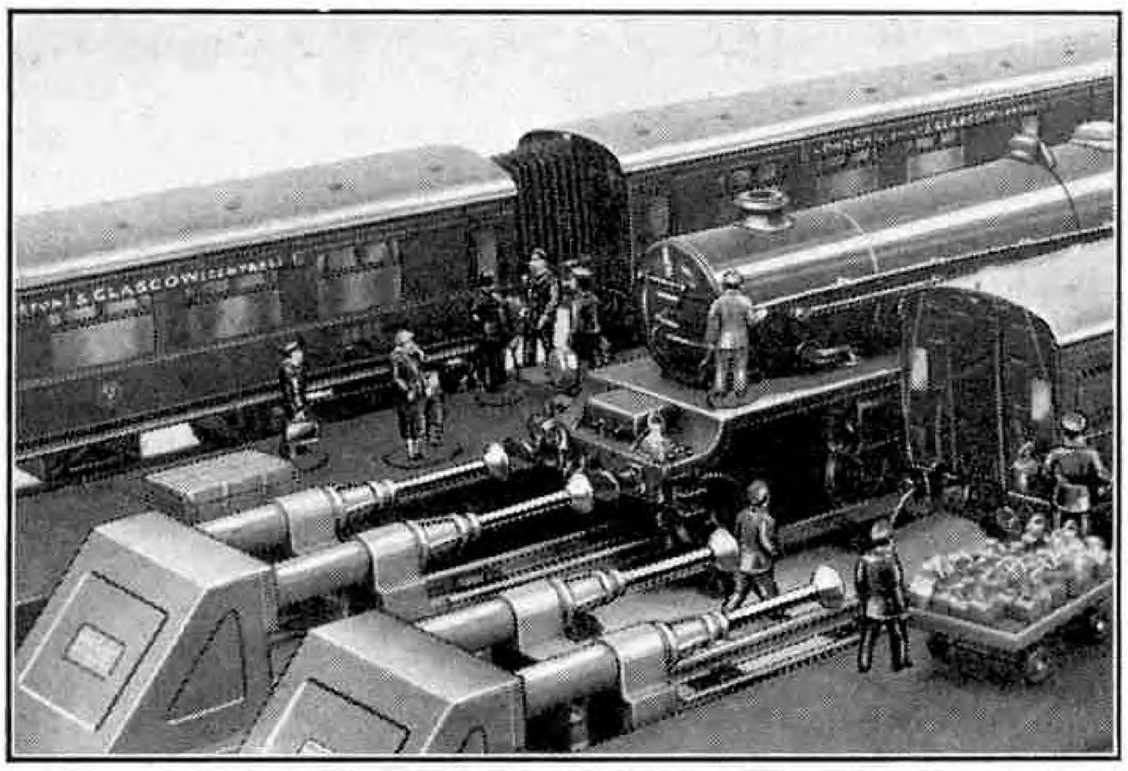
Perishable traffic by passenger train. A Palethorpes Sausage Van has been attached to the rear of an express and the man between the tracks is making sure that the couplings are secure.

Perishable traffic or the returning empty vehicles connected with such traffic can be conveyed by passenger train. It adds considerably to the interest of train working if a van for the conveyance of some particular kind of traffic is attached at an intermediate station and worked forward to some other point, either another intermediate station or a terminus. At an important junction the manœuvring of a van worked in this way can be carried out by means of the regular shunting engine, but at smaller centres the aid of a Dinky Toys Horse (Dinky Toys No. 2a) may have to be invoked! Shunting horses are still used to some extent in actual practice.

The upper illustration on this page shows an interesting example of perishable traffic conveyed by passenger train. A Palethorpes Sausage Van, a recent introduction into the Hornby Series, is shown attached to the rear of an L.M.S. express. When traffic of this kind is being worked the disposal of the necessary staff to deal with it should not be neglected. One or two porters on the station platform can attend to the transfer of the miniature hampers contained in Railway Accessories Set No. 1 from platform trolley to van. It is important too that when a van has been attached to a train at a wayside station the couplings between the van and the train should be secure, and one of the station staff should be "told off" to look after this.

A welcome feature to the traveller at many stations is the refreshment wagon propelled along the platform by one of the refreshment room staff. For a Hornby Station the Dinky Toys Trailer No. 25g with its rubber-tyred wheels makes an admirable chassis for such a vehicle if the tow bar at the front end is removed so that the front now becomes the back. A cardboard "upper deck" or tray is made and supported at the corners by accurately-cut matchsticks secured by Seccotine. The central feature of the tray should be a "tea urn," for which a thimble or a similar metal cap will do very well; minute triangles and sections of cardboard touched up with paint to serve as the contents of the tray can be mounted on "plates" of the same material. The trolley when finished should be in charge of one of the Dinky Toy Waiters No. 5b, in white jacket and cap.

We have already considered terminal working from the point of view of the despatch of trains, and now we must consider the preparations necessary for their arrival. At many termini incoming trains have their regular platforms and when their composition is known the platform staff can be in position to perform their work immediately on arrival. In miniature therefore it is necessary for the model railway operator to have his staff ready. Porters should be placed at intervals along the platforms, as if waiting to open carriage doors and generally attend to the wants of passengers, and one or two luggage barrows should be placed at about the place where the composite coaches at each end of the train will stop as if waiting for any unusually heavy consignments. The Stationmaster should be on the platform to see that the train is well up to time and the Ticket Collector ready to deal with passengers from the train.



A scene at a Hornby terminus. The driver is going round his engine after arrival, and the men on the near platform are distributing new tail-lamps for old!

A feature of most terminal stations is the inclusion of a roadway along one of the main platforms where taxi cabs wait. For a miniature taxi rank arranged near the platform, or perhaps immediately outside the station, the smart Taxi Cab, Dinky Toys No. 36g, is ideal.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

"FIND THE MISTAKES IN THIS JOURNEY"

It is surprising what frequent mistakes can be made even by regular travellers in describing railway journeys. A little while ago we read a description of a journey that had been made by a person mildly interested in railway operation. The account was generally in order, but there was a certain amount of confusion here and there and it occurred to us that the discovery of what was wrong would make a suitable subject for a simple but interesting "Errors" Competition.

The description of the journey is as follows:

"I had to go to Manchester from London, calling at Leicester, Nottingham and Sheffield on the way, and I chose the L.M.S. route from St. Pancras as I was anxious to travel over one of the most picturesque railways in the country. After leaving London we were soon speeding past Radlett and St. Albans. I could not help thinking of the days when Midland trains used to run into King's Cross before the opening of the line to St. Pancras, the last to be opened into London. The train stopped at Kettering and here a number of people got out, I suppose to catch a connection for Cambridge.

"Soon after this we were held at a signal for some minutes. I looked out of the window, as I invariably do on such occasions, and I noticed that neither driver nor fireman got off the engine to report our presence in the signal box, although the signal post carried a white diamond board showing that a call box was provided on the spot.

"On the next stage of the journey we stopped at Loughborough but the smart timing of the train meant some fast work near Ruddington before running into Nottingham. On leaving for Sheffield we were soon in the colliery area, passing a seemingly endless procession of coal trains, chiefly hauled by 0–8–0 engines. At Pye Bridge I saw a porter loading a container with sacks full of mails. We passed Clay Cross and then stopped at Chesterfield, where George Stephenson spent his last years. Chesterfield is famous for its leaning spire, and from there a smart run was made to Sheffield.

"The run from Sheffield to Manchester is very grand, cutting across the wild Pennine district. At Penistone to my great joy I caught sight of the giant "Beyer-Garratt" banking engine that spends its days assisting heavy coal trains. The run over Woodhead has a special fascination for those who admire the work of the steam locomotive. The impending electrification will however be of considerable benefit to traffic and the tunnel—the longest in the country—will no longer be the bane of the traveller. A brisk run down into Manchester left me with the impression that my trip had been quite interesting and enjoyable."

Competitors should read the account over carefully several times, writing down each slip as it occurs. Finally a neat list should be prepared for forwarding to Headquarters.

The contest will be divided into the usual Home and Overseas sections and prizes of any Meccano products to the value of 21/–, 15/– and 10/6 will be awarded to the senders of the three most complete lists. Envelopes containing entries should be marked *"H.R.C. Rail Journey Contest"* in the top left-hand corner. Entries should bear the H.R.C. number, name and full postal address of the competitor and should be posted to reach Headquarters at Meccano Limited, Binns Road, Liverpool 13, not later than 31st December. The Overseas closing date is 31st March 1939.

Railway Jokes Contest

A certain District Superintendent of a colonial railway gave strict instructions that he should be informed immediately by telegraph of any unusual incidents that occurred on the line in his area. One day a native stationmaster sent the following message: *"Man fell on line in front of engine. Will wire details later."* In a short time the promised "details" came through. *"Man unhurt; everything O.K.; engine going backwards."*

Possibly some readers are familiar with this story, but to others it may not be so well known. We reproduce it in order to give a lead to competitors in our Christmas *"Railway Jokes Contest."* Jokes or funny stories of railway interest have a special appeal for H.R.C. members. Every member must know at least one railway joke, and will hear others during the approaching Christmas season, which we are sure will be one of fun and happiness for all H.R.C. members and their friends. We should like to share in the fun and this month therefore we are asking them to forward to us what they consider to be the best railway joke or story they hear either at home round the fireside, in the Branch room, or when talking with railway friends. The chance of winning a good prize should stimulate either the memories or the inventive powers of members, and we look forward to a large number of entries.

Each competitor can send in as many jokes as he likes in this contest, but can, of course, only win one prize. The chief aim should be to submit stories that are new as well as funny. Three prizes will be awarded and they will consist of any product manufactured by Meccano Ltd. to the value of 21/–, 15/– and 10/6 respectively in each section, Home and Overseas. In addition a number of consolation prizes will also be awarded. Envelopes containing entries should be marked *"H.R.C. December Jokes Contest"* in the top left-hand corner and posted to reach headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st December. The Overseas closing date is 31st March 1939.

Each competitor should make sure that his name, full postal address and H.R.C. membership number appear on the back of each sheet submitted.

COMPETITION RESULTS

HOME

September "Photo Contest No. 6."—First: D. Fear (18477), Taunton, Somerset. Second: H. S. G. Darke (4461), London N.W.11. Third: O. McCann (54110), Dublin. Consolation Prizes: B. Franey (42436), Southgate, London N.14; D. J. W. Brough (8246), Cheam, Surrey; B. Sackville (60299), Handsworth, Birmingham 20; D. H. Wakely (17486), Cheam, Surrey; E. Oldham (43390), Hyde, Cheshire; G. H. Wood (21541), Halifax.

September "Errors Contest No. 2."—First: F. Mills (31), Kearsley, Nr. Bolton. Second: A. G. Wells (9100), East Dulwich, London S.E.22. Third: J. C. Button (10335), Crewe, Cheshire. Consolation Prizes: A. J. V. Jeffries (55031), Addiscombe, Surrey; J. McIntyre (31781), Paisley; J. L. Makin (30933), Allestree, Derby; R. Burrows (6144), Saltford, Nr. Bristol; N. I. MacLean (58773), Dunoon, Argyll.

OVERSEAS

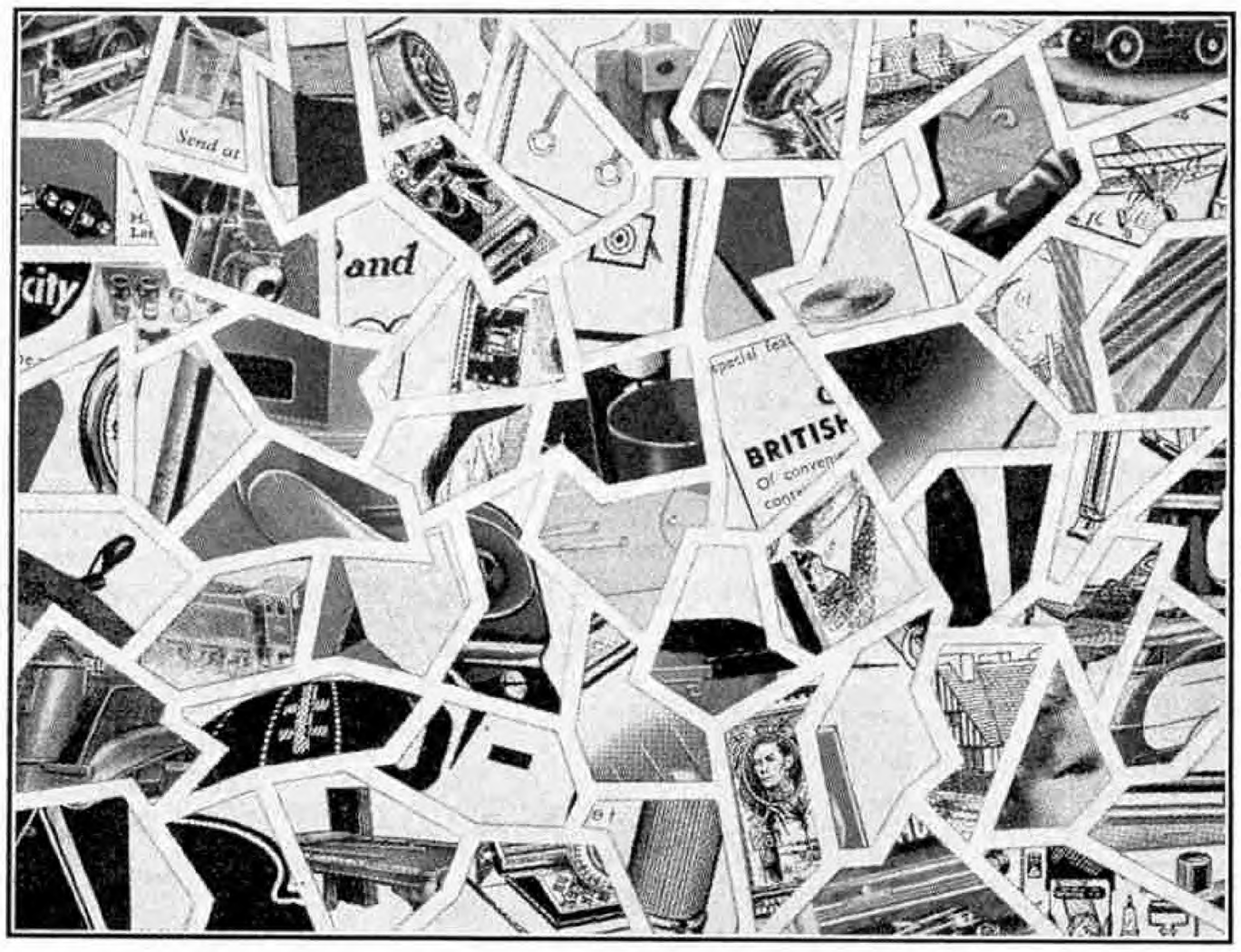
June "Photo Contest No. 3."—First: H. Bennett 10615), Auckland, S.W.2, New Zealand. Second: P. Macdonald (43305), Toronto, Canada. Third: G. Taylor (59265), New South Wales, Australia. Consolation Prizes: A. G. Fellows (29952), Auckland, N.4, New Zealand; G. Heron (28331), Natal, South Africa; R. B. McMillan (9592), Victoria, Australia; R. Myburgh (37538), Cape Province, South Africa; T. Watson (18065), New South Wales, Australia; R. A. Schmidt (53854), Wellington, New Zealand.

June "Layout Contest."—First: J. Ridgway (51742), Johannesburg, South Africa. Second: A. A. Shawky (53749), Giza, Orman, Egypt. Third: M. P. Senji (18118), Madras City, India. Consolation Prizes: E. H. Ball (52573), New South Wales, Australia; D. Murison (37642), Buenos Aires, South America.

Competition Corner

ADVERTISEMENT JIG-SAW CONTEST

The Advertisement Jig-Saw Contest that was featured in the December "*M.M.*" last year was so very popular that we feel sure the majority of our readers will welcome another competition of the same type. Finding the advertisements represented in the picture in the centre of this page will prove amusing and interesting, and for the keenest and most observant also will be profitable.



The picture consists of 58 fragments that have been cut from advertisements appearing in this issue, and readers are invited to discover the names of the advertisers from whose advertisements the fragments have been taken. It will be a simple matter to trace some of the pieces, but others will prove not quite so simple and will tease the most lynx-eyed competitors. It is one of our secret ambitions to set a fair competition that will baffle all our readers. Time and again we have cherished a belief that we have succeeded, only to find a number of readers pop up smilingly to prove that their wits are no less sharp than ours!

In their solutions competitors must give the names of the advertisers concerned, and where an advertiser has more than one advertisement in this issue, the number of the page from which the fragment is taken must be stated.

Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the four most accurate lists in order of merit, and in addition there will be a number of consolation prizes. Entries for the competition must be addressed to "*Jig-Saw Advertisement Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must be forwarded to reach this office not later than Monday, 19th December. The prize-winners will be advised by post on 20th December, and their prizes will be despatched to arrive on Christmas Day.

Another set of prizes, of the same value and to be awarded in similar conditions, will be awarded in the Overseas Section, open to readers living outside Great Britain, Northern Ireland, Eire and the Channel Islands. Overseas closing date 31st March 1939.

December Drawing Contest

Each month throughout the winter we are holding drawing competitions, open to readers of all ages. No special subjects will be set, the monthly prizes being offered simply for the best drawings or paintings submitted during the month. Entries may be of any size, mounted or unmounted.

Each month's entries will be divided into the usual two sections, A for readers aged 16 and over and B for those under 16; and prizes of Meccano products or artist's materials, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section. There will be separate sections with similar prizes for Overseas readers.

Entries in the December competition must be addressed "*December Drawing Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than Monday, 19th December. Prize-winners will be notified before Christmas. Overseas closing date, 31st March 1939.

December Photo Contest

As was announced in our October issue, we have decided to continue our photographic contests throughout the winter.

The conditions of the winter series of contests will be similar to those held during the summer. Any outdoor photographs of autumn and winter interest will be eligible, but indoor subjects will be restricted to table-top photographs of the type described in the article on page 612 of our November issue and in that on page 684 of this issue.

Entries will be divided into the usual two sections, A for readers aged 16 and over; B for those under 16. Prizes of Meccano products or photographic materials to the value of 21/– and 10/6 will be awarded in each section. Entries to this month's contest should be addressed "*December Photo Contest*, Meccano Magazine, Binns Road, Liverpool 13." Closing dates: Home section, 19th December; Overseas section, 31st March 1939.

COMPETITION RESULTS

HOME

October Photo Contest.—First Prizes: Section A, J. E. Martin (Fishguard); Section B, N. R. Thomson (Edinburgh). Second Prizes: Section A, C. A. Reader (London S.W.18); Section B, C. B. Berry (London W.2).

October Crossword Puzzle.—1. F. G. Tidey (Hassocks). 2. T. D. Tasker (Barnsley). 3. G. Patterson (Manchester). 4. M. J. Carter (Sutton). Consolation Prizes: W. A. Bradshaw (Sheffield 9); Miss L. Browning (Margate); L. W. Chitty (London S.W.20); F. Mills (Kearsley); P. Redfern (Etwall); D. L. Ryall (Ewell, Surrey).

OVERSEAS

July Photo Contest.—First Prizes: Section A, F. Schorrewegen (Lierre, Belgium); Section B, P. Gilles (Montpellier, France). Second Prizes: Section A, L. W. Humm (Geraldine, N.Z.); Section B, H. Hill (Johannesburg). Consolation Prizes: P. Halbwachs (Curepipe, Mauritius); J. A. Anderson (Ashburton, N.Z.).

July "Hidden Proverbs" Contest.—1. S. Robertson (Capetown, S.A.). 2. B. J. Collins (Sydney). 3. R. M. Anderson (Toronto). 4. J. Abbott (Vancouver). Consolation Prizes: M. O. Imana (Ibadan, W. Africa); R. Muhl (Krugersdorp, S. Africa).

SETS (Postage Extra)

5	Bhopal	8d.	
5	Burma	4d.	
10	"	9d.	
13	"	1/2	
3	Charkhari	2d.	
5	Cochin	2d.	
10	"	5d.	
5	Deccan	2d.	
10	"	5d.	
5	Hong Kong	2d.	
10	" "	5d.	
15	" "	9d.	
3	" " Cor. ...	1/-	
10	India	2d.	
15	"	3d.	
20	"	4d.	
25	"	6d.	
5	Johore	3d.	
5	Kenya	3d.	
10	"	6d.	
1	Cook Island Cor.	4d.	
4	Kedah	2d.	
7	Negri Sembilan ...	5d.	
4	" " ...	3d.	
4	Pahang	3d.	
4	Perak	3d.	
4	Selangor	3d.	
3	Soruth	2d.	
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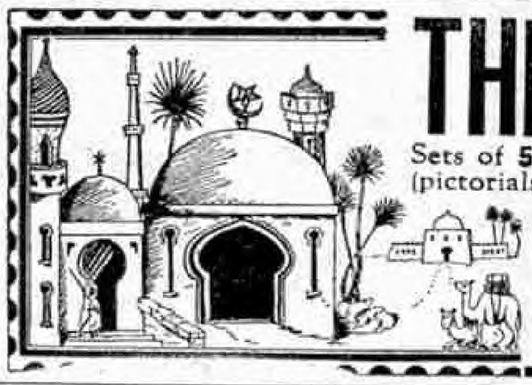
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PHILIP COCKRILL, 13, MONTRELL ROAD, STREATHAM HILL, LONDON S.W.2.

For other stamp advertisements see pages 734, 736 and xxxviii



Stamp Gossip

and Notes on New Issues



French Cancer Fund Commemorative

The 40th anniversary of the discovery of radium by Pierre and Marie Curie has been celebrated in France by the issue of a 1f. 75 stamp carrying a 50c. premium in aid of cancer research funds. The design, illustrated here, shows the Curies in their laboratory.

Pierre Curie was born in 1859 and in 1895 married Marie Slodovska, a brilliant Polish woman scientist. They combined



their researches in the field of radio-activity, and in 1898 succeeded in obtaining from pitchblende an element that was previously unknown and to which the name radium was given. In recognition of their work they were awarded the Nobel Prize in 1903.

The first values of the new French general issue are now appearing, the 10c. and 20c. stamps having been issued late in October. The design shows a head of Mercury who bears in his hand the well-known serpent-entwined wand that was his badge of office as messenger to the Gods.

Dutch Anniversary Air Mails

The 10th anniversary of the opening of the air mail service between Holland and the Dutch Indies in November 1928 has been celebrated in the Dutch Indies by the issue of the two stamps, 17½c. and 20c. values, illustrated in the corner panels at the head of this page.

The designs show port and starboard front views of one of the most up-to-date machines engaged in the service, and are a most attractive addition to the range of aeroplane designs.

The stamps were on sale for only a short time and were withdrawn on 30th November.

* * * *

The 75th anniversary of the cession of the Ionian Islands by Great Britain to Greece will be celebrated in May 1939, and as part of the celebrations Greece will issue a short series of commemorative stamps.

* * * *

Barbados probably will issue a short series early next summer to commemorate the tercentenary of the first meeting of the General Assembly of the Colony.

New Dominion Pictorials

Canada's series of new reign stamps has been completed by the appearance of a 13c. stamp on 15th November. Originally, it was intended to issue a 13c. value in June last, but considerable difficulty was experienced in fitting a suitable design into the general plan followed in Canada's issue of higher denomination stamps. The chosen design, illustrated here by courtesy of the Postmaster-General, Ottawa, shows a view of the entrance to the harbour at Halifax, Nova Scotia.

Australia's new ½d. stamp, illustrated on this page, is likely to prove one of the most popular issues from this popular country. The picture of a kangaroo is certain to command interest.

The kangaroo inhabits scrub and pasture land, and is found abundantly in all parts of Australia, the average height of a fully grown animal being slightly less than 6 ft. Much larger specimens have been known, however, and some years ago the remains of a 9 ft. specimen were unearthed in Darling Downs. The kangaroo is remarkably fast in movement and is capable of keeping pace with a fast motor car. It bounds along on its hind feet, using its tail as a balance, and leaps distances of 12 to 15 ft. at each bound. It is a formidable opponent when on the attack, and can deliver a devastating punch with its feet.

Another new Australian stamp is a high value, £1 denomination, showing head and shoulder portraits of the King and Queen in full Coronation robes and regalia, against a plain dark background. The design is so very attractive that it is to be regretted that its use is to be confined to a high value of only occasional service.



A South Sea Jubilee

The 20th anniversary of the accession of Queen Salote Tubou to the throne of the Tonga Islands has been celebrated by the issue of three stamps, 1d., 2d. and 2½d. values, bearing the design shown here, a full length portrait of Her Majesty in Coronation Robes. Tonga is one of the Friendly Islands, which form a British protectorate lying in the South Pacific Ocean, 1200 miles from New Zealand.

Liberian Air Stamps

The recently issued Liberian series of air stamps has provided a most attractive range of designs that will delight every one of our readers who is fond of birds.

There are 10 stamps in the series and the five designs include flight pictures of a crowned eagle, great egrets and terns.

Simplified Catalogue of 59,000 Stamps!

The 1939 edition of *"Stanley Gibbons' Simplified Stamp Catalogue"* has 1149 pages, and gives details of 59,033 stamps.



Its price is 5/– net, Stanley Gibbons Ltd., 391, Strand, London, W.C.2.

The trend of modern Empire stamp design is well shown by the new edition of this popular catalogue, for it includes 678 new King George VI issues from 62 Dominions, Colonies and Territories. King George VI stamps have now replaced the old issues nearly everywhere throughout the British Empire, and how different are the bright new stamps from the first issues of King George V. In the past the sovereign's head was all that was normally shown. To-day delightful miniature views of the Colonies, illustrating famous beauty spots, historic scenes, important industries, or even specially interesting animals, birds and reptiles, more often than not share stamp space with the royal portrait.



The past year has also seen some very interesting new issues from the rest of the world. New names which appear for the first time are Alexandretta and Italian East Africa, while outstanding new issues include the wedding and birthday issues of King Farouk of Egypt, the striking Irish high values featuring St. Patrick, the last stamps of vanished Austria, a Czecho-slovakian stamp showing the Skoda armament factories at Pilsen, and sports issues from France, Panama and Roumania.

The popularity of stamp collecting continues to grow. Clear evidence is the fact that the present edition of this catalogue is the seventh (exclusive of several large reprints) to be published in four-and-a-half years—a record in stamp catalogue publishing!

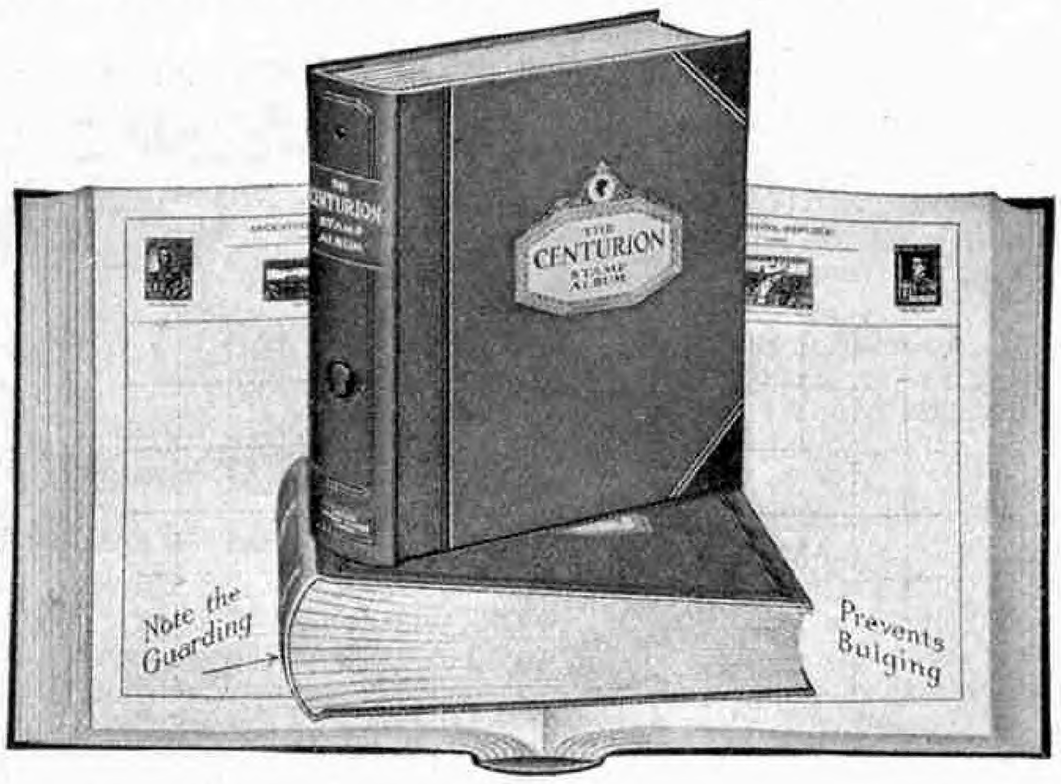
This catalogue would make an ideal Christmas present for any young stamp collector. It is an invaluable guide.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

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A fine way of getting stamps at Christmas is to write for a STANLEY GIBBONS' APPROVAL SHEET. They cover every country so you can ask for those of countries you are particularly interested in.

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There are hundreds of stamps priced at from as low as a penny each so, no matter how little you have to spend, you will get a fine lot of new stamps for your album from your purchase.

THREE BRILLIANT NEW GIFT PACKETS

CHRISTMAS 1938 PACKET

120 DIFFERENT NEW ISSUES UNUSED OF THE PAST 12 MONTHS, inc. Newfoundland (Princess Elizabeth), Papua (pictorial air), Sudan (scarce air provisional), Bulgaria (chickens and boy Prince), Czechoslovakia (Armaments), Iceland (Geyser), Italy (Marconi), Jugoslavia (searchlights), Norway (reindeer), Panama (sports). **PACKET S 4894.** Price **12/6**, *post 2d. extra.*



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82 DIFFERENT UNUSED KING GEORGE VI STAMPS. Remarkable and thoroughly representative packet as about 45 different parts of the Empire are represented and **every stamp has a different design,** many of them beautiful pictorials.

PACKET S 4895. Price **10/–**. *post 2d. extra.*

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AN EVEN BIGGER AND BETTER "NEW REIGN" PACKET. 146 DIFFERENT UNUSED STAMPS of the reign of King George VI, including all those in Packet S 4895 (see above) and additional higher values, making a splendid and very handsome display of the newest Empire stamps, which any collector will appreciate.

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STAMP COLLECTING

CHRISTMAS CHARITY STAMPS

CHRISTMAS is the one time of the year when all charitable appeals can be sure of commanding sympathy. It is not surprising therefore that more and more countries are adopting the practice of making an annual Christmas charity stamp issue, and the collector who sets out to compile a collection of Christmas charity stamps will find an exceptionally interesting range of material covering widely diverse subjects and designs.



Switzerland can claim to be the pioneer of Christmas charity issues, for the first of the famous "Pro Juventute" series appeared 25 years ago. The Swiss issues have another claim to special interest, however. No other charity issues are so generally used in their countries of issue. Indeed, in Switzerland it is regarded more or less as a point of honour that every letter posted shall bear at least one of the "Children's Stamps."

In the early days of the "Pro Juventute" issue, the designs were principally illustrations of the quaint costumes of the various cantons, and later armorial bearings of various cantons and cities were used. Since 1927 the lower values have ranged once again over national costumes and armorial bearings, and have included Swiss national sports and scenery, but the highest value has always been reserved for a portrait of some Swiss worthy whose memory it has been desired to honour.



We illustrate three stamps from this famous series. These are the 5c. of the 1917 issue, showing a young girl in the traditional costume of the Unterwalden district, the 7½c. of the 1919 issue, bearing the arms of Nidwalden, and the 5c. value of the 1932 issue, showing a Swiss athlete in a display of the famous Swiss flag game.

Turning now to other countries that have made a regular feature of Christmas charity issues, we come to Austria and find a range of stamps of exceptional beauty and outstanding interest. The first series appeared in 1932 and used designs consisting of portraits of the famous Austrian composers Haydn, Mozart, Schubert, Bruckner, Johann Strauss and Hugo Wolf, with Beethoven, practically the whole of whose musical life was spent in Vienna. Musicians from all parts of the world snapped up this series, which is deservedly one of the most popular stamp series ever issued.

The 1926 issue also had a special interest for the musical world, for its designs were based on scenes from the legend of the Nibelungs on which Wagner based his famous Ring Operas. Since 1931 the designs of the Austrian issues have been devoted to portraits of famous Austrians as follows: 1934, Architects, 1935, Heroes, 1936, Inventors, 1937, Doctors. We show the 12 gr. value of the 1936 Inventors series. The portrait is that of J. Ressel, famous for his pioneer work with screw propellers.

Belgium has made a point of devoting the proceeds from its annual Christmas issues to Anti-Tuberculosis Funds. The first appeared in 1925, the design being a very simple one showing a nurse holding high above her head a shield bearing the double cross, the international symbol of the fight against the tuberculosis scourge. In 1926 a similar design showed the shield borne by a Belgian lion. The high values in this series showed portraits of King Albert and Queen Elizabeth.



Belgium's 1927 issue is famous for its "Three Men in a Boat" design, the picture showing three monks in a storm-tossed oarless boat. The point behind this design is just a little obscure, however. The three monks look decidedly ill, but even the most robust of men would be somewhat uncomfortable in such trying circumstances! Special reference must be made to the 1929 series, for this provided a most attractive set of views, the outstanding design being that showing the Menin Gate at Ypres, where stands the memorial to the British soldiers who laid down their lives in Belgium during the Great War. This is on the 35c. value, illustrated here.



Germany's Christmas charity issue also appeared in 1925, the series consisting of three designs bearing the arms of Prussia, Bavaria and Saxony respectively. Similar designs were used in 1926, 1928, 1929, but since that time various themes have provided the designs. These have inspired a portrait of Field-Marshal von Hindenburg, a range of peasant costumes, views of famous German towns and castles, typical professional men and crafts, and, most recent of all, last Christmas, a series of striking shipping pictures. Our illustration is from the 1931 series and shows a view of Heidelberg.



The 1933 series is probably the most interesting set, for it showed scenes from Wagner's operas *"The Flying Dutchman," "Rhinegold," "The Mastersingers," "The Valkyrie," "Siegfried," "Tristan and Isolde," "Lohengrin" and "Parsifal."*





Holland's series, which first appeared in 1924, are for the benefit of child welfare charities. The design for the first set showed a child's head within a framing of angel's wings. The next three years, 1925, 1926 and 1927, saw the arms of various provinces of Holland in the designs, and in 1928 portraits of Dutch celebrities were used. Since 1929, however, the stamps have been devoted almost exclusively to portraits of children, and we use the 1933 design for our illustration. This shows a bonny child holding aloft the Star of Epiphany.

The Dutch Indies also have made a feature of Christmas charity issues, and on two occasions, 1932 and 1936, the design included the familiar (Continued on page 737)

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4 ICELAND, 4 rare MANCHUKUO, 4 MOROCCO (large views), 5 MOZAMBIQUE Pictorials and 6 TUNIS. These 23 attractive stamps free to collectors who ask to see our bargain approval sheets. Send 1½d. for postage (abroad 9d.)

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WORLD COLLECTIONS: 500 different **1/9**; 1,000 **3/9**; 2,000 **9/-**.
1,000 unpicked Foreign, off paper, 200—300 kinds, many unused, **1/9.**
500 British Colonials ... ... **1/9.**

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FINE PICTORIAL STAMPS FREE

This wonderful packet containing only LARGE PICTORIALS mostly bi-coloured—IVORY COAST, SENEGAL, WALLACE IS., 3 POLAND, ALGERIA 1937, AUSTRALIA (Commemorative), S. AFRICA, UKRAINE, CORONATION, TUNIS, Set of HUNGARY, CZECHO-SLOVAKIA, 2 EQUATORIAL AFRICA (New), etc. The above packet will be sent FREE to all who apply for my new lists of approval sheets and send 1½d. for postage. In addition all who send me stamp collectors' addresses will receive 6 Persia or 6 Venezuela stamps FREE. 100 B. Colonial 1/-, 20 Airpost 6d., 6 Triangulars 7d., 1,000 different 3/11, 20 Brazil 6d., 20 Peru 6d.

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for sale lot—the stamps are wonderful value.

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Fine packet of unused African stamps from Belgian Congo (river scene), Morocco Agencies King Geo. VI, already obsolete, Italian East Africa (Abyssinia, etc.), Sudan, Somali Coast, Kenya, Cameroons, a fine set of 5 Ivory Coast, new issue, inscribed in error 'Baloue Woman' for 'Baoule Woman'—one is already obsolete—and another set, only just issued, of French Guinea, Mozambique, etc., etc., 30 stamps in all, sent free to all genuine applicants for approvals enclosing 2d. postage. Only one gift to each applicant.

R. D. HARRISON — ROYDON — WARE

PICTORIAL COLONIALS ONLY

I specialise in Brit. Col. approvals and will send you an absolute bargain selection of pictorials (Geo. VI if required). Do you want current, recent or what issues?
"Collections," 39, Cross St., St. Annes-on-Sea, Lancs.

DON'T BUY JUNK!

Let us send you our **OVERSEAS** packet containing 100 different selected stamps, **NO** Europeans and over half Colonials. Post free 2/-.
THE SIDCOT STAMP CO., HEATON, BOLTON.
The Heligoland Specialists.

FREE XMAS COMPETITION

for **ALL** ardent Stamp Collectors. Many prizes will be given away. For **FREE BOOKLET** of particulars send your full name and address with ½d. stamp to: **The Standard & Universal Stamp Co. (D.M.12), 16, Gloucester Circus, Greenwich, S.E.10.**

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75 Different Foreign and Colonial Stamps selected from Collections presented to Hospital. Send 6d. and addressed envelope to:
SECRETARY,
Memorial Hospital Hall, Woolwich, LONDON S.E.18.
An approval sheet from our limited number will be sent on request.

XMAS GRATIS

As a Special Xmas Gift we offer you **FREE** a fine large packet of uncommon stamps (no junk) nearly all Pictorials with many New Issues and some very scarce old items **AND** a Perforation Gauge **AND** a Rule **AND** a Watermark Detector **AND** Roulettes Guide. **ALL FREE.** Among stamps included in the Packet you will find **PALESTINE** (Jerusalem View); **HUNGARY** (Turul); **NEW ZEALAND** (K. Edward); **RUANDA-URUNDI** (Palm Trees); **SAMOA** (1877 Express); **TOGO** (Seaside); **EGYPT** (Pyramids and Sphinx); **JAPAN** (New issue); **CANADA** (Set of K. George VI); **ABYSSINIA** (Emperor); **TANGANYIKA** (Lake Victoria); **PORTUGAL** (Reaper); **AUSTRALIA** (Animals and King); **CHILE** (Columbus); **SWITZERLAND** (1882); **INDO-CHINA** (River Boat); **BRAZIL** (Wandenkolk); **TUNIS** (Arab Woman); **TRANSVAAL** (King) and **BULGARIA** (Royal Palace). All these will be sent you absolutely **FREE** together with an Approval Selection if you send 2d. stamps to:
WINDSOR STAMP CO. (DEPT. M), 59, LEE ROAD, BLACKHEATH, S.E.3.

FREE packet U.S. Commemoratives to applicants for ½d. approvals. Carlile, 120, Bournbrook, Birmingham.

"Worth While." **I GIVE YOU FOR CHRISTMAS Different**

25 — CEYLON — 25

including **Queen Victoria, Edward VII, George V Jubilee, War Tax Coronation.**

This representative collection of Ceylon stamps will be sent to all applicants who send postage and ask to see a selection of my "WORTH WHILE" approval sheets. Remember . . . . "WORTH WHILE" sheets for stamps worth while.
JOS. H. GAZE, 21, Atwood Road, Didsbury, Manchester.

1939 POCKET DIARIES FREE

Each collector spending 2/6 or more will receive a diary **FREE.**

200 assorted (off paper) includes George V and VI British Colonials, Foreign, Russia, Persia, Coronations, Jubilees, 2/-.

100 diff. British Cols. 1/1½ (no two packets alike). Set 4 Mint Air Mozambique Triangulars 7½d. Postage Free (abroad extra). Postal Orders only accepted. Satisfaction guaranteed or money returned.
A. JENKINS, 83, DUKE'S DRIVE, CHESTERFIELD.

100 RUSSIAN — FREE!

To all applicants requesting approvals. DISCOUNT 2d.—1/-. Fine large pictorials, etc. World selection. Please enclose 2d. to cover postage. Don't miss this special offer.

J. D. COWIE,
4, Kings Road, Kingston-on-Thames.

FREE! EXHIBITION PACKET containing 50 different stamps, including **ANTWERP 1894** and **BRUSSELS 1896 EXHIBITIONS**, etc., 250 mounts, duplicate book, and perforation gauge. Request approvals. Enclose 2d. postage. No approvals sent abroad. A. R. Dickie (Dept. M), 23, Winscombe Crescent, Ealing, W.5.

UNUSUAL XMAS OFFER TO NEW APPROVAL APPLICANTS
Apply for our All Pictorial Approvals at ½d. to 3d. and enclose 2d. for postage and packing. You will not only find our approvals unbeatable value, but will receive one of our splendid Xmas gifts of a handy writing set, containing Lever Self-Filling Fountain Pen, Propelling Pencil, refills and eraser. Do not miss this, get on our list right away. **Court, 924, Walsall Rd., Gt. Barr, Birmingham.**

FREE 110 DIFFERENT STAMPS FREE

To introduce my excellent approval selections of British Colonials, I am presenting free of charge this quality packet of stamps, including pictorials from British Guiana, Jamaica, Canada, Malta, Australia, New Zealand, Kenya, Ceylon, Tasmania, etc., and many other stamps too numerous to mention, to all genuine approval applicants (post free).

Eric J. Watts, 184, Northampton Road, Wellingborough.

FREE STAMPS

100 all different, 2 Indian Silver Jubilees and 1 Mozambique Triangular Air Mail

to introduce my low-priced approval books containing stamps from ½d. Liberal discount given, and a list of 133 further bonus gifts of Coronations, Jubilees, Commemoratives. Please send 2d. for postage.

C. A. RUSH, 38, Queen's Av., Whetstone, N.20.

100 DIFFERENT STAMPS FREE to applicants for ½d. approvals. Cox, 14, Broadmead Av., Worcester Park.

FREE GEORGE VI & 100 DIFFERENT

A Short Set of George VI Pictorials, at my option, also 100 Different, Colonial and Foreign, will be sent free of charge to the **First 100 Genuine Applicants requesting Approvals** and enclosing 2d. in stamps for return postage, etc. (Only genuine applications considered.) **KINGSMILL STAMP CLUB.** Send 1½d. stamp for details. Write NOW to: **BM/BO9N, LONDON W.C.1.**

THE GIFT OF THE SEASON

25 diff. 1938 and recent issues including 10 King George VI, no common Europeans but all good stamps, given free to all applicants for approvals who enclose 2d. for postage and ask for particulars of my free gift and bonus schemes. Abroad 6d. P.O. These gift stamps would cost you about 2/- if purchased separately.

C. A. Masters, Broadstone, Dorset.

ALL APPLICANTS

for approval sheets enclosing 2d. for postage (abroad 6d.) will receive this **FREE PACKET** containing **Spanish Morocco** (pictorial), **Monaco** (1938), **Ceylon** (George VI pictorial), **Ecuador** (large pictorial), **Ruanda-Urundi** (pictorial, new), **New Zealand** (birds), **Canada** (pictorial), **Morocco, French Soudan** and others. New approval sheets ready. Good discount. Exchange desired with all Colonies and Dominions.

F. G. ROWE, 69, EDGEHILL ROAD, BOURNEMOUTH.

For other stamp advertisements see pages 732, 734 and xxxviii

Stamp Collecting—(*Continued from page 735*)

badge of the Salvation Army, to whom the proceeds from these issues were given. Surinam, another Dutch Colony, included the famous red triangle device of the Y.M.C.A. in the design for its 12½c. value of its 1933 series. In the ordinary course, however, the proceeds of the Surinam Christmas issues have been given to a charity known as the Green Cross, which is responsible for welfare work amongst natives in the colony.

The designs for Luxemburg's issues have been confined almost entirely to Royal portraits. The children of the present Royal Family appeared from 1926 to 1931, and subsequently portraits of some of the earlier ruling Princes of the country have been used. The most interesting of these is the portrait of Duke Wenceslas II, Good King Wenceslas of carol fame, which was used in last year's issue.

The Saar Valley has made regular issues since 1926, when a series of designs depicting the work of the army medical services and of the hospitals was used. From 1928 to 1931 the designs were inspired by famous paintings such as "*The Blind Beggar*" by Dyckmans and "*Charity*" by Raphael. The 1932 series used views of important churches and cathedrals in the Saar Valley, while the 1933 issue used a series of designs drawn from statues in the churches of St. Louis and St. Elisabeth, Saarbrücken.

Only one regular series of Christmas charity stamps is produced in the British Empire, the New Zealand "Health" series which has appeared each year since Christmas 1929. The charming designs used in this series has earned for it a popularity second only to the Swiss "Pro Juventute" series. Many collectors indeed rank it first. The most interesting design in this series is the one used for the first issue, a picture of a nurse, exhorting collectors to "*Help Stamp out Tuberculosis.*" This rare example of a stamp pun, perpetrated quite innocently, ensured an immediate popularity.

It will be seen that Anti-Tuberculosis campaign funds are the principal beneficiaries from Christmas charity stamp appeals and it is fitting, therefore, to conclude this article with the story of some stamps that will never be mentioned in the stamp catalogues because they are merely humble, though gay, little "stickers" known as Christmas Seals. No fairy tale conceived by Hans Andersen is more beautiful, and, strangely enough, it was a fellow Dane, Einar Holboell, who was responsible for the first Christmas Seal.

Einar Holboell was a postal official, and was greatly distressed by the sight of little children, living in the poorer districts of his town, who were suffering from that terrible disease tuberculosis. He saw thousands upon thousands of letters and parcels passing through his post office at Christmas time, and suddenly the idea came to him that if only a stamp could be designed—not a regular Government postage stamp, but a specially decorated stamp—to sell for a half-penny, something the people could buy and put on their Christmas letters and parcels, the money from the sale of those stamps could be used to build a hospital for treating sick children.

He laid his idea before the King and Queen of Denmark, and the result was that not only did Denmark adopt the idea, but nearly every country in the world is now selling special stamps to raise funds for the purpose of fighting the children's most deadly enemy.

Six years ago the first Christmas Seal sponsored by the National Association for the Prevention of Tuberculosis was sold in England, and this year there will be millions of these gay little messengers going through the post on the backs of Christmas letters and on packages. Each one bears the Season's Greetings, and represents a girl standing in the snow with outstretched arms beneath the double-barred scarlet cross, which was first displayed on the banner of Godfrey de Bouillon, a famous leader of the First Crusade.

Those of our readers who are desirous of supporting the scheme can obtain supplies of the seals from the National Association for the Prevention of Tuberculosis, Tavistock House, North, Tavistock Square, London W.C.1.

Advance details of the 1939 Christmas charity issues were not generally available at the time of going to press, but by courtesy of the Dutch Post Office we are able to give particulars of the Dutch child welfare series. This is to be placed on sale on 1st December. There will be five stamps, each bearing a very charming design showing a boy playing a flute while sitting among flowers beside a tiny pond. A goldfish and a dove are shown in listening attitudes. The design is symbolic of the nearness of children to nature.



A Stamp Voting Contest

The outstanding feature of the stamp collecting world this year has been the great flow of new reign British Colonial stamps. The new stamps, almost without exception, are distinguished by beauty of design, and it is not easy to say which of them might fairly be considered the best. Our readers might care to take this task upon themselves, however, and for that purpose we reproduce on this page nine representative stamps of the new reign. Readers are invited to place them in their order of merit, having regard to beauty of design as well as interest of subject.

Prizes of stamps or stamp collecting accessories to the value of 21/–, 15/–, 10/6 and 5/– respectively, to be chosen by the winners from the lists published by stamp dealers advertising in this issue of the "*M.M.*," will be awarded to the four readers whose lists most nearly forecast the order of popularity decided by our readers' votes. In addition there will be a number of consolation prizes, value 2/6 each, for the next best entries.

Readers are asked to state on a postcard, A, the stamp they like best, and, B, their forecast of the order of popularity in which the stamps will be placed by the massed votes of all taking part in the competition.

It is not necessary to refer to the stamps by name; they may be identified by numbering them from left to right, thus, Nos. 1 and 2 in the top row, Nos. 3 and 4 in the second row, Nos. 5, 6 and 7 in the third row and Nos. 8 and 9 in the bottom row.

Entries should be addressed "*Stamp Voting Contest*, Meccano Magazine, Binns Road, Liverpool 13," and should be sent to reach this office not later than Monday, 19th December. The prize-winners will be notified by letter, sent to reach them on Christmas morning.

There will be a separate competition for Overseas readers, with prizes of the same amounts to be awarded in exactly similar conditions. Overseas entries must arrive not later than 31st March 1939.

Send the Sheets Back Early

A stamp dealer friend the other day paid the "*M.M.*" a charming compliment and simultaneously launched a little grumble. "Your readers," he said, "are a fine lot of boys and are splendid customers, but I do wish some of them would not keep my approval sheets quite so long."

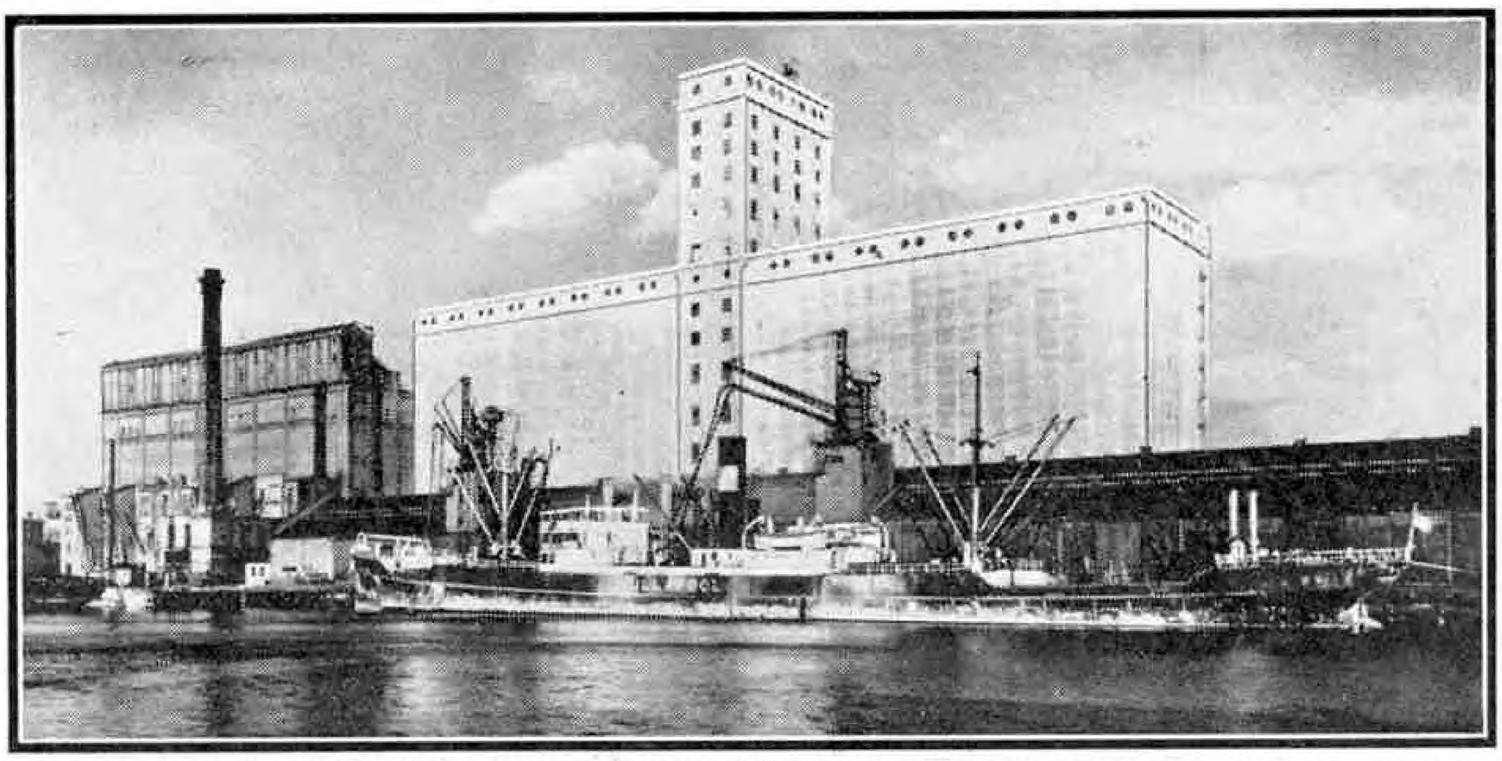
It seems some of his boy customers have been making a practice of keeping sheets for six or seven weeks, although the maximum period stipulated by our friend, and most other dealers, is four weeks. The effect is to prevent the dealer from circulating those particular sheets as quickly as he plans and other boys are deprived of the opportunity to see them.

In ordinary circumstances four weeks is a long enough period to permit a group of approval sheets to be studied carefully, and we ask every reader to make a point of returning sheets within that time. When special circumstances arise, no dealer will refuse a reasonable extension.

The Oldest Tree in the World

One of the most extraordinary trees in the world is the gingko, or maidenhair tree, for it is the sole survivor of a race of plants that were widely distributed over the Earth millions of years ago. Its ancestry in fact dates back to the plants that eventually were transformed into coal, and it is not now known in the wild state. It has been preserved because Buddhists regard it as sacred and plant it round their monasteries and temples, and from China and Japan it has been carried to other parts of the world. A Dutch surgeon introduced it to Europe nearly 250 years ago, and gingkos were first planted in Great Britain about 1750, one of the earliest of these being a great tree now growing in Kew Gardens.

This remarkable survivor of a past age reaches a growth of nearly 20 ft. in the East, and as it grows old curious excrescences appear on its trunk. It gets its common name from its fan-shaped leaves, which resemble those of the maidenhair fern.



A grain silo in Brunswick Dock, Liverpool. Photograph by courtesy of the Mersey Docks and Harbour Board.

Canyons in the Sea

We have long been accustomed to the idea of the existence of valleys in the ocean floor, but have always looked upon them as similar to valleys on land. Now it seems that many of them are steep-sided canyons of enormous depth, some of which are so large that even the Grand Canyon of the Colorado could be engulfed in them. Off the coast of New England there are submarine canyons with walls more than 4,000 ft. in height. Another gash off West Africa is of similar size, and off the mouth of the Indus River, in India, there is one that descends 3,000 ft. below the surrounding sea floor.

At first it was supposed that these canyons were formed by rivers flowing over land that has since sunk under the sea, for many of them can be traced to the mouths of existing rivers. They are totally unlike river valleys in shape and form, however, and it is now suggested that currents in the sea have been responsible for them, or that the sinking of the ocean floor itself has led to their formation. Efforts are now being made to solve the problem by measuring the canyons and their slopes more carefully.

How Hot is the Sun?

No direct answer can be given to this question because the Sun is built up of various layers of gas at different temperatures. The hottest part is at the centre, and the only temperature that we can measure is that of the layer from which light reaches us. This we can do by comparing the radiation of heat from the Sun with that from sources of which we know the temperature, and the result is a figure of nearly 9,900 deg. F. This is higher than any temperature known on Earth, high enough indeed to boil away every element, and it is therefore easy to realise why the Sun is an immense sphere of gas without any definite surface.

It is tantalising to find that other methods that have been devised give different results. For instance one depending on measurements of the strengths of lines in the spectrum of the Sun gives lower values, and to make matters worse the results depend on what part of the spectrum the lines are chosen from. The explanation of these differences seems to lie in the different states of excitement within the Sun itself. At the high temperature met with there the atoms are in various stages and degrees of activity, and it would seem impossible to get any final figure for the temperature of what is after all a vast space full of wildly dancing particles.

Heroes of British Lifeboats

Here are lifeboatmen actually telling you of their most exciting rescues! Round the British coast travelled Gerda Shairer and Egon Jameson, persuading shy heroes to talk. You'll meet Henry Blogg, of Cromer, who does not know how many people he has saved; Richard Stephens, of the Lizard boat, who always wears a green hat; Mrs. Amelia Johnson, heroine of Gorleston; and many others. (7/6 *net.*)

Heroes of Forgotten Adventure

You've all heard of Livingstone and Stanley. But do you know of other explorers of the 19th century such as Oswell, the big-game hunter; Lord Milton, who nearly starved to death in the Rockies; Joshua Slocum, who sailed round the world in a tiny boat; and Guinnard, who was captured and enslaved by Patagonians? In this book T. C. Bridges tells of these and other intrepid men. (7/6 *net.*)

HARRAP

Aeroplane that has Made History—

(*Continued from page 682*)

short landing run and the ease of manœuvring it down on to a restricted space.

It remained the standard instructional machine of the Royal Air Force until its replacement by the "Tutor" in 1932, the only essential variations from the prototype being the adoption of more efficient engines from time to time. So there evolved the Le Rhône and Clerget-engined 504K, and the 504N. The latter type, using the modern Siddeley "Lynx" radial, can be seen to-day in many parts of the world—still earning its living.

A Listener Visits St. George's Hall—

(*Continued from page 669*)

apparently indicating that the programme was running a minute or two over time.

Last of all came the signature tune, during which the red light went out, indicating that we were no longer "on the air." Immediately, without finishing the tune, the orchestra "downed tools" and all the artistes rushed out, talking, laughing, congratulating. Huge Max Kester picked up little Arthur Askey and carried him off, presumably towards the canteen, while we donned hats and coats and made our way out into the street.

Charles Letts's Diaries for 1939

The Charles Letts's diaries are amazingly compact works of every-day ready reference, and almost every pastime, hobby and sport now has a Charles Letts's diary devoted to its own individual needs.

The "*Schoolboy's Diary*" will make the readiest appeal to most of our readers. In addition to the usual diary portion, it contains two splendid maps showing the world's air routes, and gives also interesting details of a range of careers, a lighting-up time table, and many other items of useful general knowledge. It is available in cloth at 1/3, with pencil and maps at 1/6, and in leather with pockets, pencil and maps at 3/6.

For older readers there is the "*Public School's Diary*," which is similar, but contains more advanced general information. This is published in the same bindings and at the same prices as the "*Schoolboy's Diary*."

The "*Wireless Diary*" is another splendid little publication, designed to fit the waistcoat pocket. It is encyclopædic in its range of general information and technical detail for radio experimenters. The price of this in cloth is 1/–, and it can be obtained in leather at 2/6, and in a De Luxe edition at 5/–.

The "*Motor Cycling Diary*" includes a handy series of references concerning road law, licenses and taxation, distance tables, details of famous hills, a first-aid hints section, and finally a complete record of T.T. race winners and a speed table. This is excellent value at 1/–, and in a refillable leather case, with pencils, maps and pockets extra, its cost is 2/6.

Letts's diaries can be obtained from stationers in all parts of the country, but in the event of difficulty readers should write to Messrs. Charles Letts and Company, Diary House, Borough Road, London S.E.1, mentioning the "*M.M.*"

Brown's Boy Scout Diary

This ever-popular Boy Scout's Diary for 1939 is now available, and will prove an attractive present for every Wolf Cub and Boy Scout. In addition to the diary section proper, it includes attractive coloured plates of the flags of the world and gives details of scout tests and proficiency badges, and illustrations of all principal knots. Camping and first-aid hints, full signal codes in Morse and semaphore, and hints on signalling also are provided, and the diary is suitable for Sea Scouts. It can be ordered through any bookseller, price 1/–, or direct from Brown, Son and Ferguson Ltd., 52, Darnley Street, Glasgow S.1, price 1/1 post free.



Fireside Fun

PLUCKY

First Customer: "Waiter, bring me a plate of hash."
Waiter (calling back to the kitchen): "Gentleman says he'll risk it."
Second Customer: "Waiter, I'll take the same."
Waiter (calling back to the kitchen): "Another Sport!"

* * * *

Teacher: "I've caned you five times this week. Have you anything to say?"
William: "Yes, sir, I'm jolly glad it's Friday."

* * * *

Old Lady (on board ship): "What was that noise?"
Steward: "We've just dropped the anchor, lady."
Old Lady: "I've been expecting that. It's been dangling over the front of the ship for some time!"

* * * *

Frank: "What is the difference between a dead bee and a sick elephant?"
Fred: "One is a bee deceased and the other a seedy beast!"

* * * *

A farmer was visiting a Mexican settlement after a long absence. Talking to an old friend on a ranch he said: "So old Buff's gone. Did you miss him?"
"No," replied the other. "That's why he's gone. I never miss."

* * * *

Artist: "A clever artist, my boy, can turn a smiling face into a sad one with a few strokes of his brush."
Boy: "That's nothing to brag about; my father can do it with one stroke of his stick."

* * * *

Gent.: "I can't give you anything. Charity begins at home."
Tramp: "I'm willin to go 'ome with yer."

* * * *

"Yessah," said the coloured boy, "I'se named fo' my parents. Daddy's name was Ferdinand and mammy's name was Liza."
"What then is your name?"
"Ferdiliza."

* * * *

Guide (to tourist): "There is a marvellous echo in these mountains. The people shout out of their windows when they go to bed and the echo awakens them in the morning."

* * * *

Manager: "How long were you at your last place?"
Applicant: "About the same as I am now, sir, five feet eight inches."

* * * *

NOT 'ARF!



A Cockney and his wife were visiting the Royal Academy Exhibition, when they came to a painting called "Hawking in the Olden Days."
"Awking in the Olden Days" exclaimed the Cockney. "My, they didn't 'arf do it well—on 'orseback an' all!"
"But what were they 'awking, 'Enery?" asked his wife.
"Blessed if I know," replied the puzzled Cockney, "unless they're trying to sell them blooming parrots!"

CHEAPER

Dentist: "I charge 3/6 for extractions with gas."
Abe: "I von't pay it, I vil vate till daylight."

* * * *

Teacher: "Now, if I take three from seven, what difference does it make?"
Tommy: "That's what I say. Who cares?"

* * * *

Stranger: "How are the fish to-day, old chap?"
Fisherman: "Well, I don't know; I dropped 'em a line, but got no reply."

* * * *

PAST AND PRESENT



Old Lady (as husband fails to help her up the steps of a railway carriage): "Henry, you ain't as gallant as when I was a gal."
Husband: "No, Lettie, and you're not as buoyant as when I was a boy."

* * * *

Tom: "Does a needle ever wink its eye?"
Jim: "I don't know, but answer me this one. Why doesn't the wing of an army fly?"

* * * *

Tourist out West: "Is it really healthy out here?"
Cowboy: "Say, we had to shoot a couple of fellows to start a cemetery."

* * * *

Charlie: "They tell me that in New York they have buildings 20 storeys high."
Jack: "Gee! What a time we could have sliding down the banisters!"

* * * *

"This is a new one on me," said the man who was run over by a 1939 model.

* * * *

Employer: "What I want is a smart boy, who is alert and intelligent. Are you quick to take notice?"
Applicant: "Yessir—'ad it three times in a fortnight!"

* * * *

The oculist was examining a patient and had requested him to read the top line of a test card, the letters of which ran B G F P M O N T S K Z Y X. The patient was silent. "Do you mean to say you cannot read letters of that size?" asked the oculist.
"Oh, I can see the letters, all right," replied the patient, "but I can't pronounce the word."

* * * *

New Resident: "By the way, does this city boast of a choral society?"
Postman: "Well, I can't say as that we boasts of it. We just suffers in silence."

* * * *

Burglar (to householder in bed): "I notice you sleep with the windows open. I'm a great believer in that myself."

* * * *

"My face is my ticket," said Perkins haughtily, when the new collector asked to see his season ticket.
"Very good, sir," said the inspector, beginning to take off his coat, "I have instructions to punch all tickets."

* * * *

Tim: "Why is a river lazy?"
Kim: "Because it's always in its bed."

* * * *

THIS MONTH'S HOWLER

Antony and Bismarck are the names of two metals.

NOT SO EASY

Jicks: "Nothing is impossible."
Hicks: "Did you ever try to pass through a revolving door on skis?"

* * * *

Jack: "What is it that will go up down, but will not come down up?"
Tom: "I don't know."
Jack: "An umbrella in a chimney."

* * * *

Sailor: "Yes, the Gulf is the hottest place in the world. Why, I've seen fishes swimming about with their heads above water, and perspiration running down their faces!"

* * * *

"Which do you think is the most useful—the moon or the sun?"
"The moon, of course, because it comes out at night and makes it light, whereas the sun comes out in the daytime when it's light enough."

* * * *

A hiker called at a cottage and asked for poached eggs.
"We have no poached eggs, sorr," said the cottager, "but I could be gettin' ye some foine poached rabbit."

* * * *

Judge: "Prisoner, it is your right to challenge the jurymen you object to."
Pugilist: "All right, my lord; I reserve the right until after they give their verdict."

* * * *

Tourist: "That spot is dangerous. They should put up a notice to that effect."
Local Resident: "We did have a notice there for the last 10 years, but as no one fell over we took it down."

* * * *

He was at the book counter making a purchase. "You see," he said, "I'm buying this for my son."
"A surprise, eh?"
"Rather! He's expecting a new bicycle."

* * * *

Brown: "Is there any truth in the rumour that Angus M'Tavish has bought that filling station at the corner?"
Green: "Well, I don't know for sure, but the 'free air' sign was taken down yesterday."

* * * *

Tom: "Why is a fly taller than most men?"
Jack: "I'll buy it."
Tom: "Because he stands over six feet."

* * * *

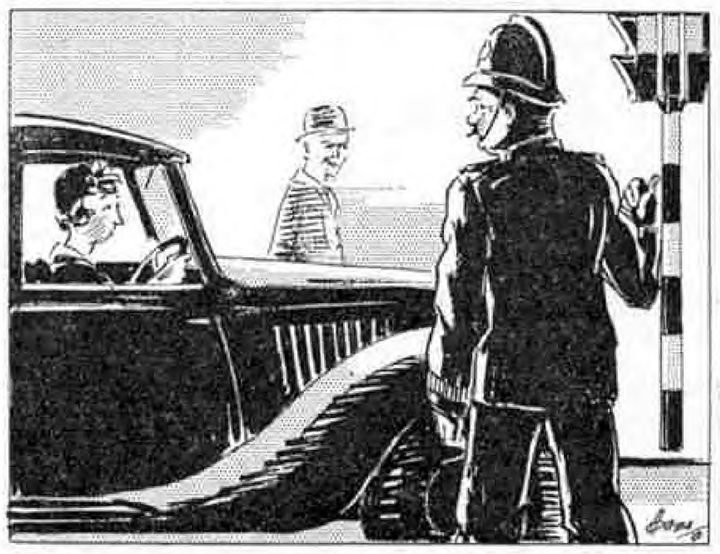
Tourist (to Indian in heart of reservation): "White man glad see red man. White man hope big chief feel tip-top this morning."
Indian (calling): "Hey, Jim, come here and listen to this bozo. He's great."

* * * *

Harry had been reading about a great earthquake. In school next day the teacher asked:
"Harry, how is the earth divided?"
"By earthquakes, sir," Harry replied.

* * * *

HARD TO PLEASE



A young woman was driving her car when something went wrong with the engine. The traffic light changed from green to red and back to green and still she could not get the car to budge.
A policeman strolled up. "What's the matter, Miss?" he enquired, "Ain't we got colours you like?"

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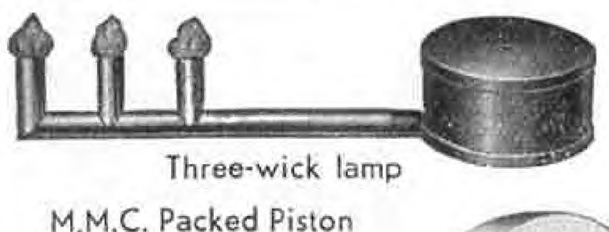
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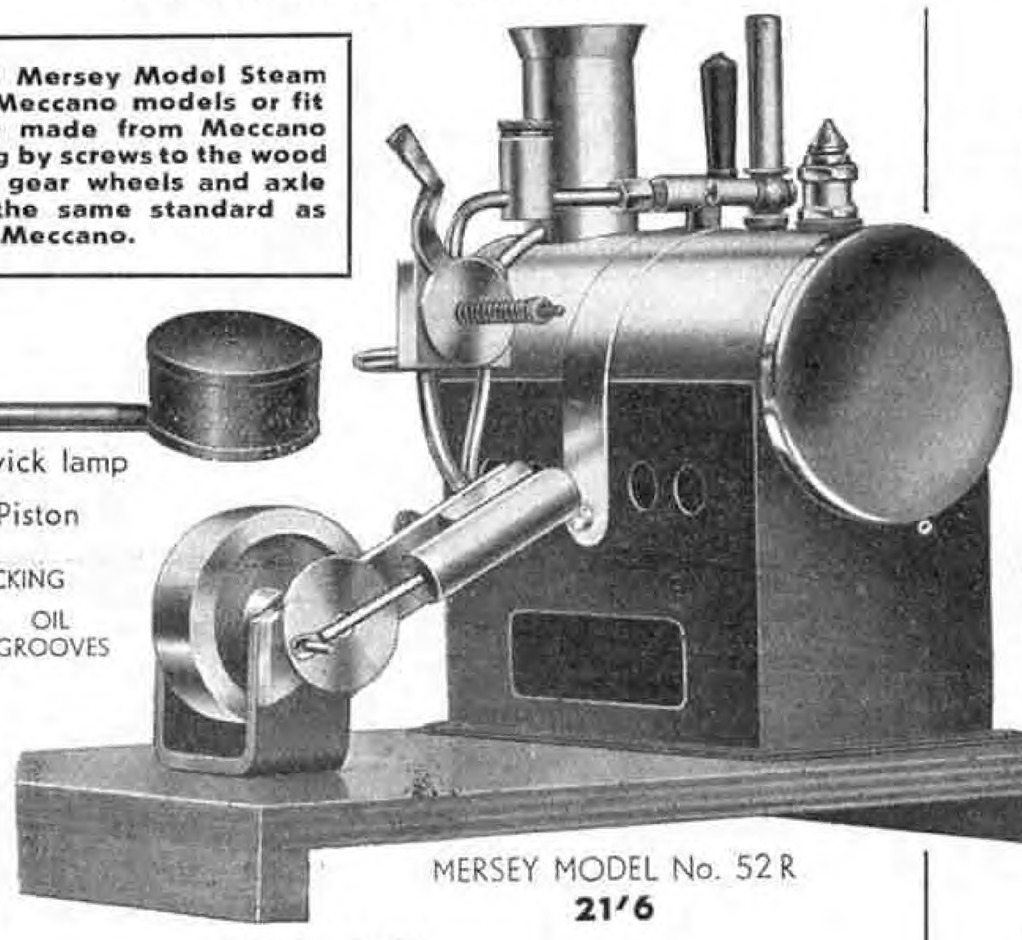
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M.M.C. Packed Piston



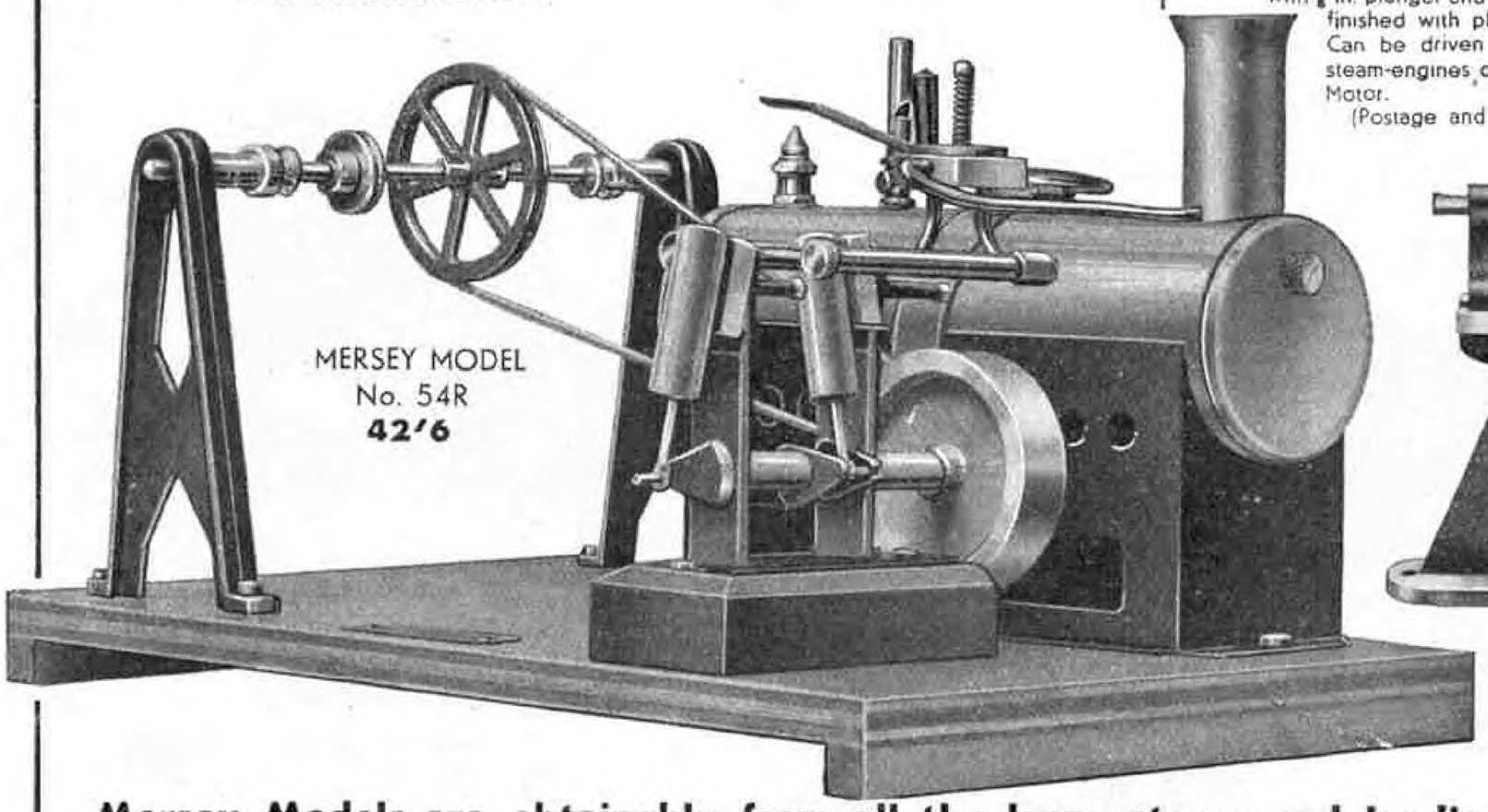


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Model 53R. Single speed, reversing*	**31'6**
Model 52GR. Two speeds, reversing*	**34'6**
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Model 54R. Twin cylinder, single speed, reversing†	**42'6**
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Model 55. Three cylinder, single speed*	**45'6**
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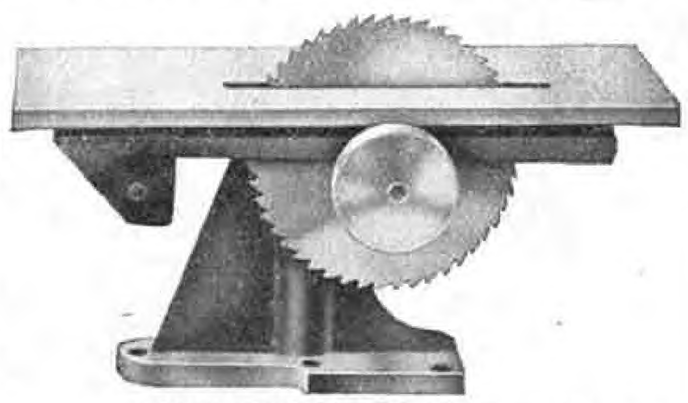
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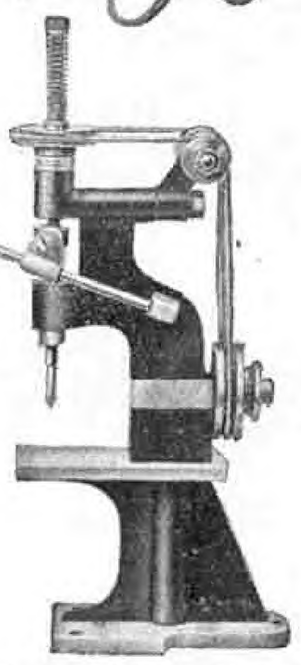
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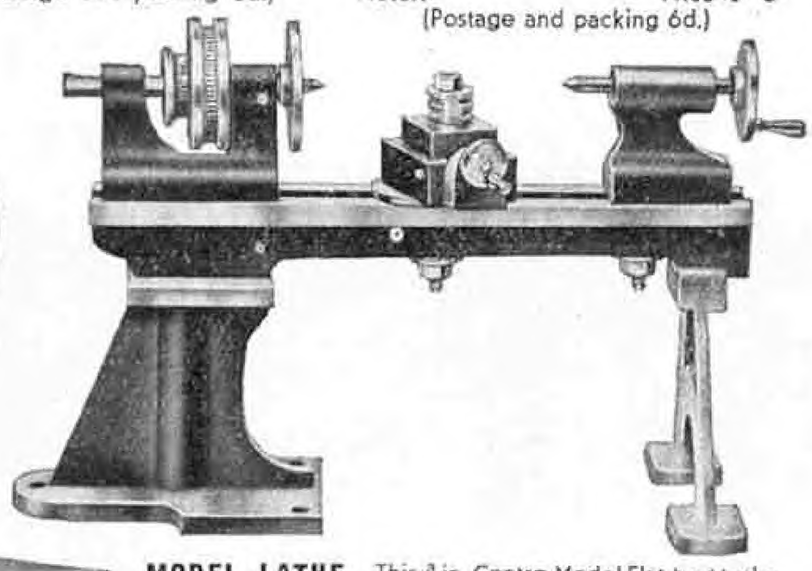




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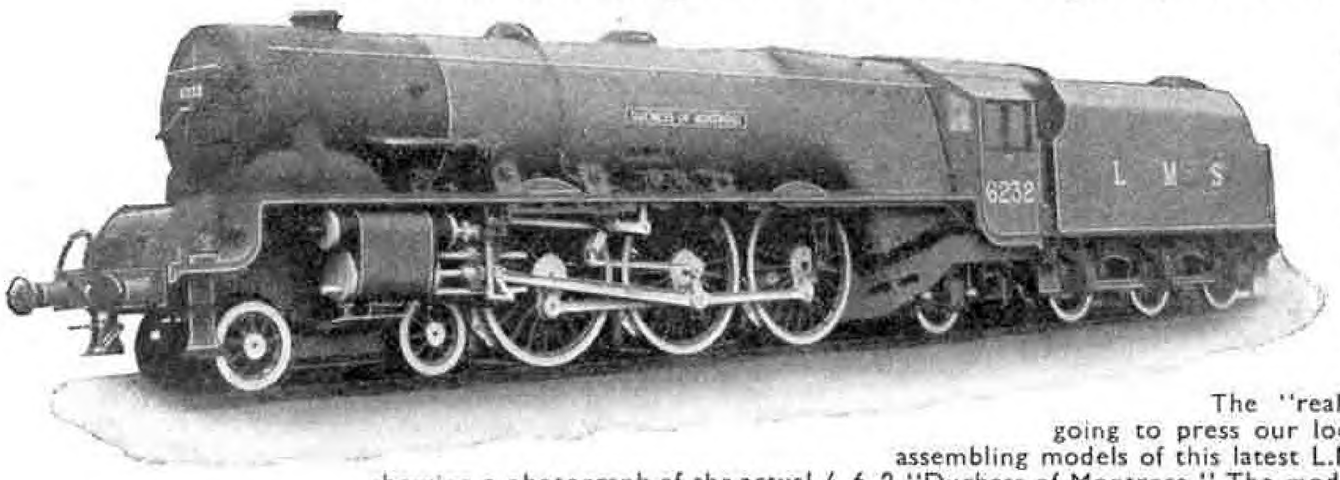
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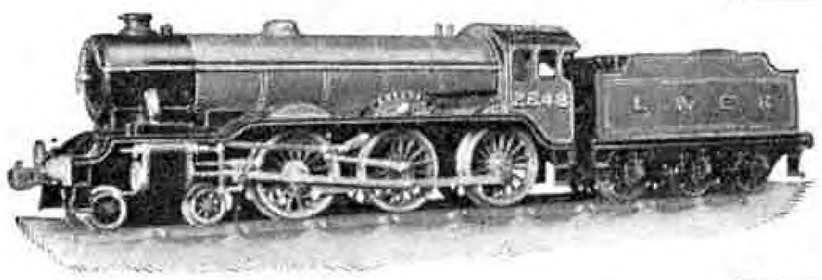


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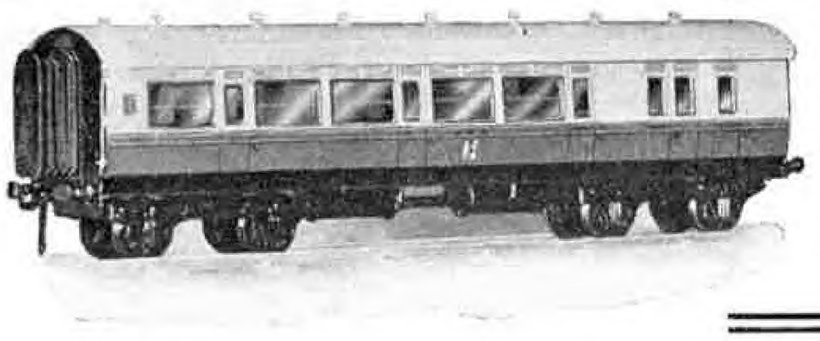
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Box 1	**Model Lighting ... 2/6**	**Box 4**	**Model Lighting ... 10/6**
Box 2	**,, ,, ... 5/–**	**Box 5**	**and ... 15/–**
Box 3	**,, ,, ... 7/6**	**Box 6**	**Experimental ... 21/–**
		Box 7	**(Cabinet de Luxe) 30/–**

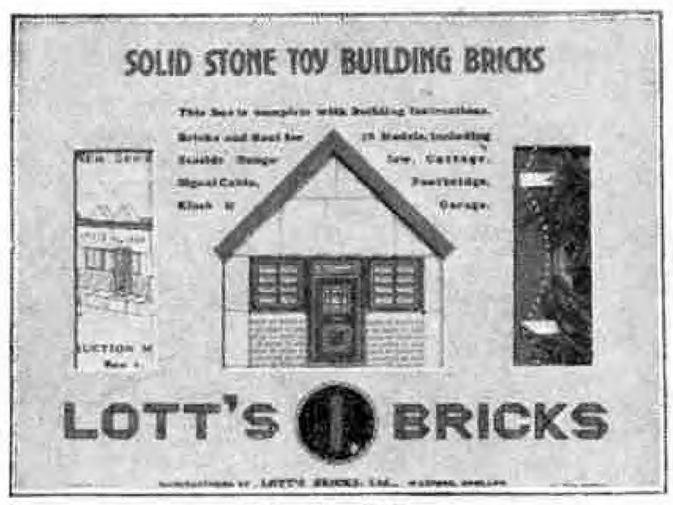
LOTT'S WONDERBRIX

Charming and realistic miniature houses, etc., can be built with these inexpensive Toy Stone Building Bricks. Just the very thing for your OO Gauge Railway, a real model village complete with Garage, Cottages, etc., to say nothing of Engine Sheds and Goods Sheds—in fact, just the very thing for use with all miniature toys. Be sure to ask your dealer for full particulars.

LOTT'S BRICKS (New Series)

You'll like these new Lott's Bricks more than ever because they're designed to build modern buildings. They have amongst other things special SUN TRAP windows and doors. You will recognise them because they are packed in jolly Silver Boxes with transparent windows and wrappings. You can still get the Old Series, however, if you like them best.

New Series Prices 3/6, 5/–, 7/6, 10/– and Supplementary Sets 1/6 and 2/6



Box 1, 3/6



Box 3, 7/6

LOTT'S TUDOR BLOCKS AND BUILDEC

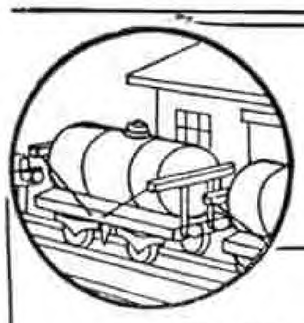
For building models of Old English half-timbered houses, Tudor Block Sets are the greatest fun! They contain Bricks coloured to represent windows, doors, and old-fashioned brickwork, together with Roofs, Shrubs, etc., and Coloured Instruction Book. Buildec is something that always appeals to youngsters who like painting—and who doesn't? It consists of stone bricks supplied uncoloured, together with Roofs, bottles of special Buildec paint and brush. Each set contains illustrated instructions showing how to build ever so many models and decorate them in any colour you like! When a new coat of paint is needed you just wash off the old paint. Hours and hours of exciting fun with Buildec!

TUDOR BLOCKS, prices 3/–, 5/6, 7/6 to 21/–

BUILDEC, prices, Box 0—12 models—3/6 Box 1—24 models—5/– Box 2—36 models—7/6 Box 3—48 models—12/6

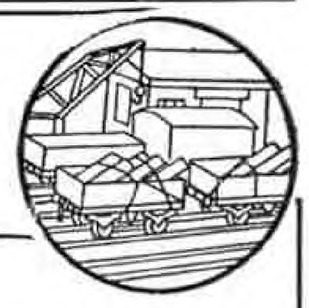
Ask your dealer for full particulars or write to the manufacturers (Dept. M.M.) for illustrated lists of all products.
(1d. stamp on p.c., 1½d. stamp on letters, please.)

LOTT'S BRICKS LTD., WATFORD, HERTS.



HORNBY ROLLING STOCK

GAUGE O

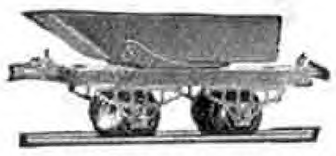




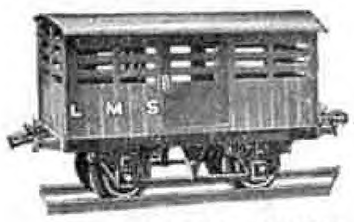
The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished.
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.



BARREL WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **2/6**



No. 0 ROTARY TIPPING WAGON
Price **1/6**



***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design.
Price **2/3**



SAUSAGE VAN "PALETHORPES"
Fitted with sliding doors.
Price **2/3**



OIL TANK WAGON "ROYAL DAYLIGHT"
Price **1/11**



No. 1 PETROL TANK WAGON "ESSO"
Price **1/11**

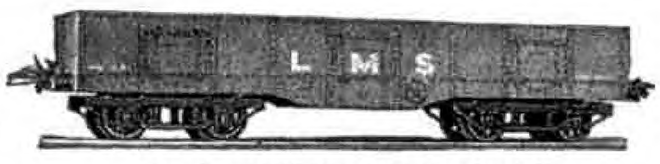
No. 0 REFRIGERATOR VAN
Lettered L.M.S., G.W., N.E. or S.R. Finished with the appropriate details. Price **1/6**

***No. 1 WAGON**
Price **1/6**



***FLAT TRUCK**
Complete with Container.
Price **2/-**

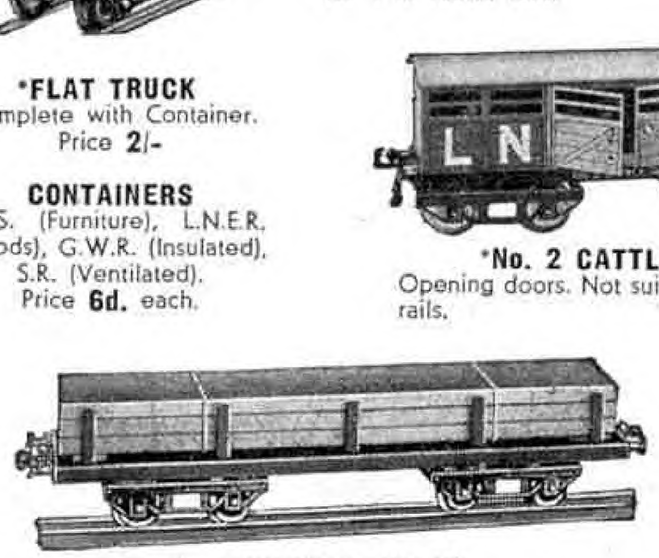
CONTAINERS
L.M.S. (Furniture), L.N.E.R. (Goods), G.W.R. (Insulated), S.R. (Ventilated).
Price **6d.** each.



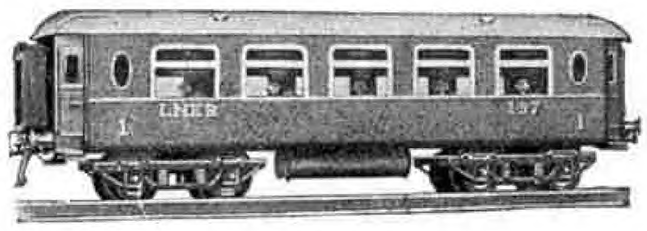
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W.R. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails. Price **4/-**



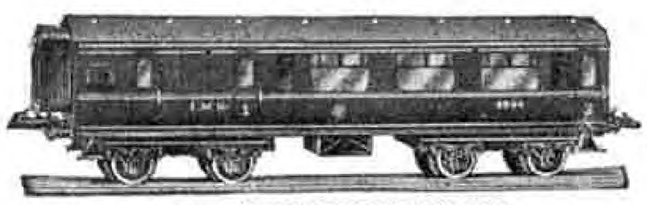
***No. 2 CATTLE TRUCK**
Opening doors. Not suitable for 1 ft. radius rails. Price **4/6**



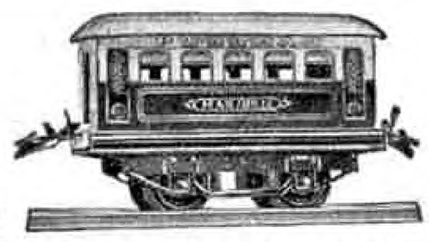
No. 2 TIMBER WAGON
Not suitable for 1 ft. radius rails. Price **2/6**



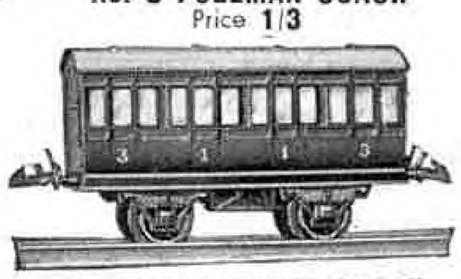
No. 2 SALOON COACH
L.M.S. or L.N.E.R. Not suitable for 1 ft. radius rails.
Price **10/6**



***No. 2 CORRIDOR COACH**
L.M.S. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



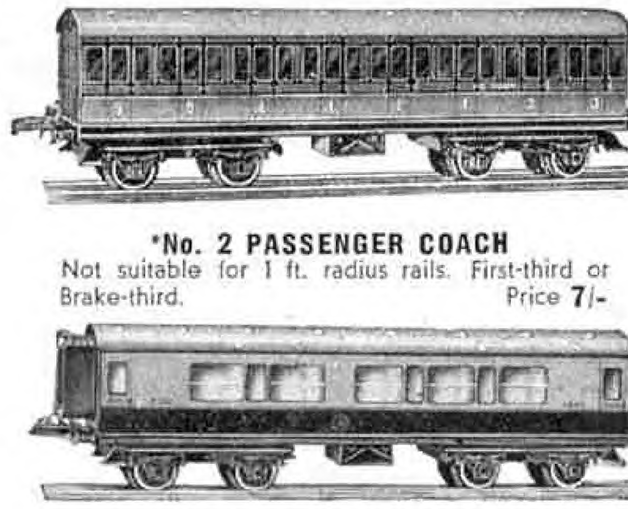
No. 0 PULLMAN COACH
Price **1/3**



***No. 1 PASSENGER COACH**
Price **2/6**



No. 2 LUMBER WAGON
Fitted with bolsters and stanchions. Not suitable for 1 ft. radius rails. Price **2/11**



***No. 2 PASSENGER COACH**
Not suitable for 1 ft. radius rails. First-third or Brake-third. Price **7/-**

***No. 2 CORRIDOR COACH**
G.W. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/-**



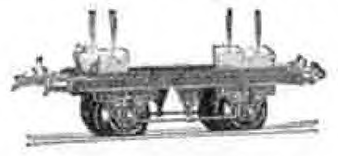
MILK TANK WAGON "NESTLES MILK"
Price **4/6**



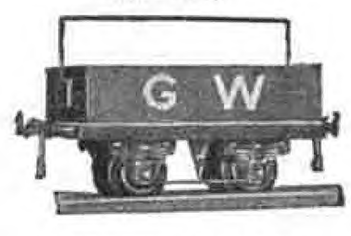
"PORTLAND CEMENT" WAGON
The door at the top opens. Finished in bright yellow.
Price **1/11**



COAL WAGON
Fitted with embossed representation of coal. Price **2/3**



No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport.
Price **1/3**



***OPEN WAGON "B"**
Fitted with centre tarpaulin supporting rail.
Price **2/-**

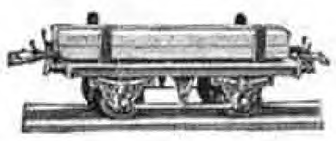
*Lettered L.M.S., N.E., G.W. or S.R.



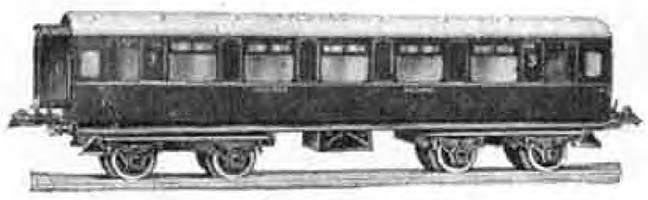
HORNBY ROLLING STOCK

GAUGE O

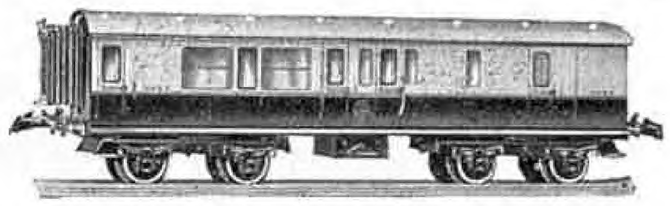




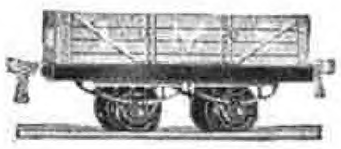
No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red.
Price **1/3**



No. 2 CORRIDOR COACH
S.R. Third class. Not suitable for 1 ft. radius rails. Price **7/6**



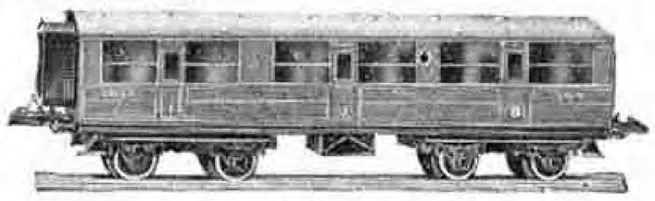
No. 2 CORRIDOR COACH
G.W. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



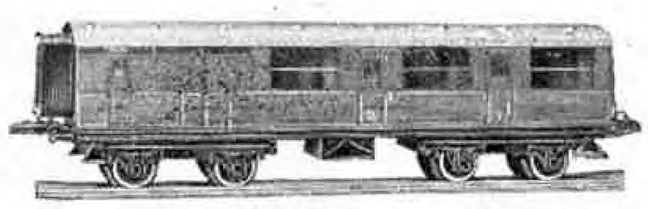
***M1 WAGON**
Price **10d.**



No. 1 CRANE TRUCK
Finished in brown and blue.
Price **2/9**



No. 2 CORRIDOR COACH
L.N.E.R. First-third. Not suitable for 1 ft. radius rails. Price **7/6**



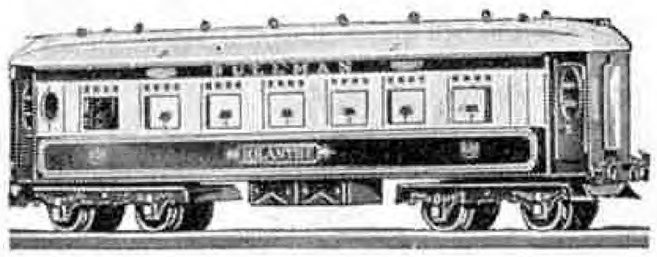
No. 2 CORRIDOR COACH
L.N.E.R. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



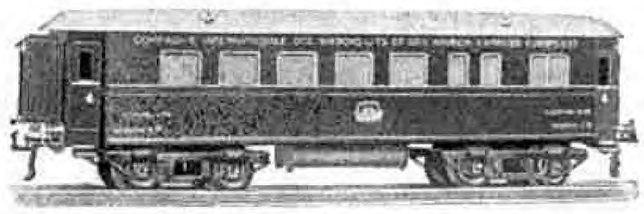
***No. 0 WAGON**
Price **1/3**



***FLAT TRUCK**
with Cable Drum.
Price **1/9**



No. 2 SPECIAL PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **13/6**

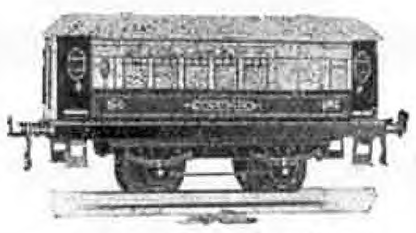


RIVIERA "BLUE" TRAIN COACH
"Dining Car" or "Sleeping Car."
Not suitable for 1 ft. radius rails. Price **11/-**

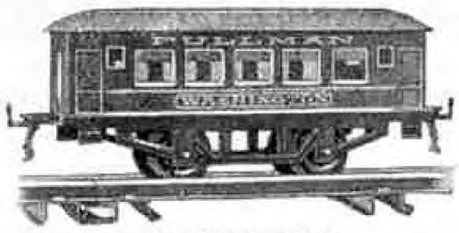
No. 3 "MITROPA" COACH
Similar in design to above. Lettered "Mitropa."
Price **11/-**



COVERED WAGON
(French Type)
Fitted with frame and sheet. Lettered "NORD." Price **2/6**

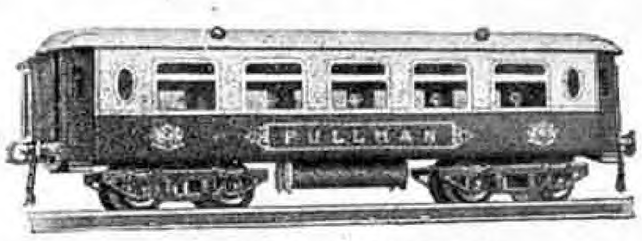


No. 1 PULLMAN COMPOSITE COACH
Price **2/6**

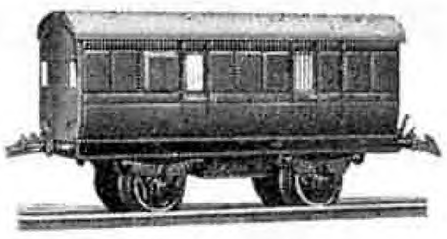


PULLMAN CAR
American Type (as illustrated).
Lettered "Washington" or "Madison."
Price **1/9**

Continental Type. "Mitropa" No. 0
Lettered "Mitropa." Price **1/9**



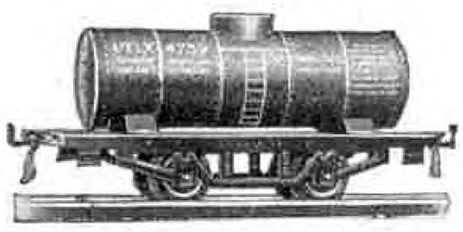
No. 2 PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **10/6**



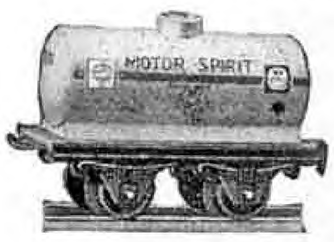
***GUARD'S VAN**
Price **2/6**



No. 1 PETROL TANK WAGON "POWER ETHYL"
Price **1/11**



TANK CAR (American Type)
As used in America for the conveyance of oil, etc. Price **1/11**



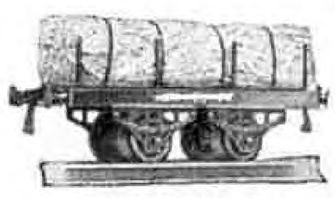
MO PETROL TANK WAGON "SHELL-B.P."
(MO Coupling). Price **1/-**



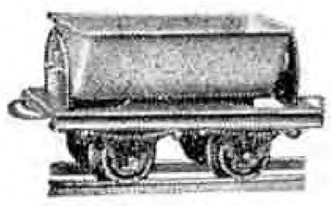
*** GAS CYLINDER WAGON**
Price **1/8**



MO CRANE TRUCK
(MO Coupling). Price **1/-**



FIBRE WAGON
As used in France and other Continental countries.
Price **1/3**



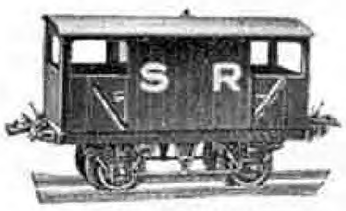
MO SIDE TIPPING WAGON
(MO Coupling). Price **1/-**



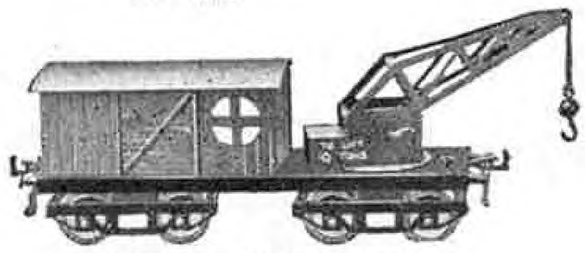
***No. 2 LUGGAGE VAN**
Opening double doors. Not suitable for 1 ft. radius rails. Price **4/6**



No. 1 SIDE TIPPING WAGON
"Sir Robert McAlpine and Sons." Price **2/-**



BRAKE VAN
Opening doors. In N.E. or S.R. lettering. Price **2/9**



***BREAKDOWN VAN AND CRANE**
Sliding doors. Not suitable for 1 ft. radius rails. Price **5/11**



No. 0 MEAT VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**



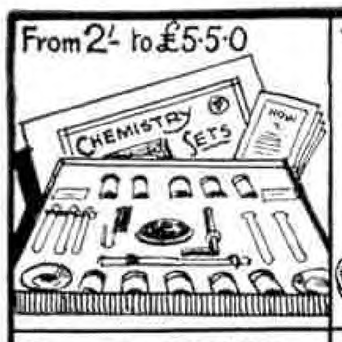
No. 0 FISH VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**

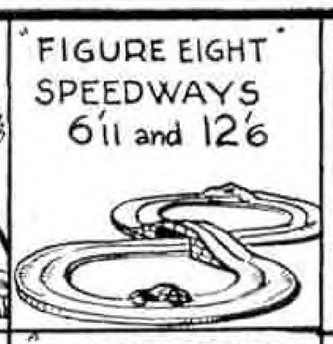


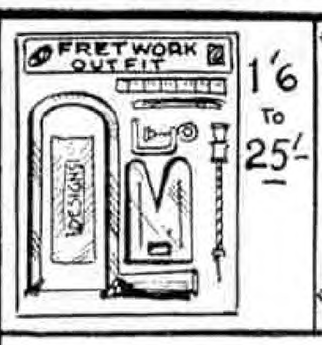
TROLLEY WAGON WITH CABLE DRUMS
Fitted with two Cable Drums. Not suitable for 1 ft. radius rails. Price **4/6**

**Lettered L.M.S., N.E., G.W. or S.R.*

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

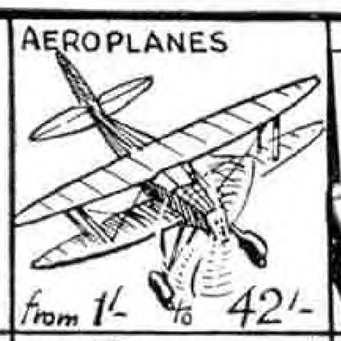






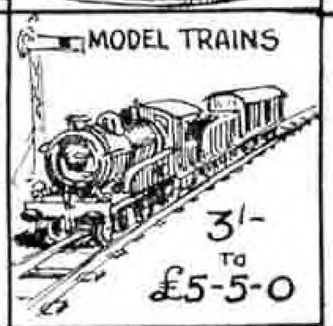








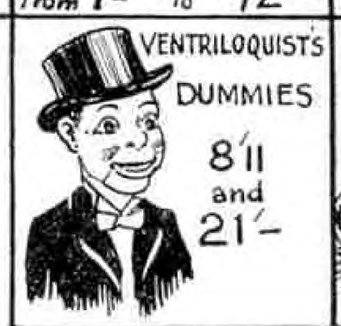


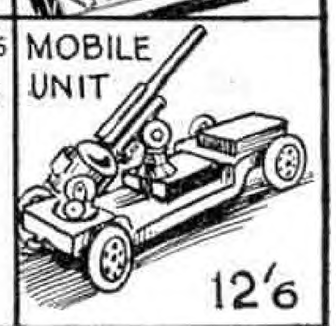


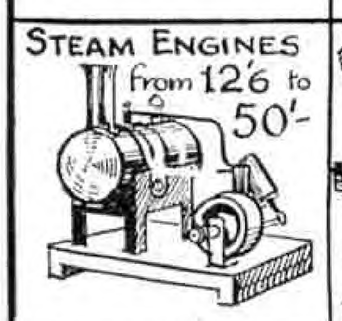
BRIGHT PROSPECTS AHEAD!

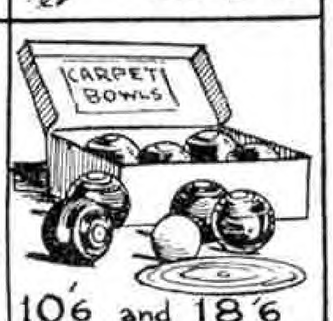
for some lucky boys. LUCAS'S store is literally packed to the ceiling with toys and games of every description. There are Conjuring Sets, Make-up Sets, Carpentry Sets, Flood-lighting Sets, Constructional Sets, Garages, Gliders, Minic, Dinky, Tootsietoys, Hornby Trains, and a complete range of Meccano. Tell Dad all about these good things NOW. If you want to obtain the fullest enjoyment in selecting "just the gift you have in mind," remember the name, LUCAS'S, the rest is easy.

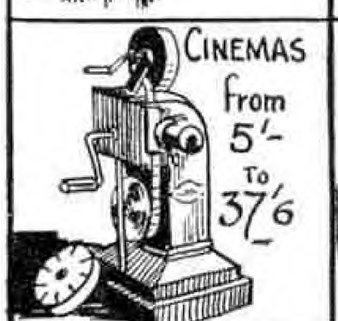
SHOP EARLY FOR XMAS THIS YEAR

















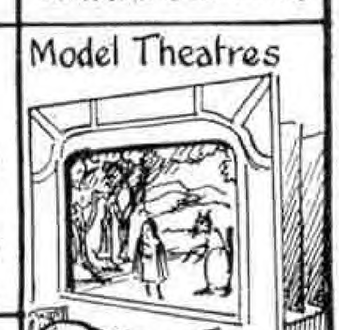
•LUCAS'S•

"The Boy's Arcadia"

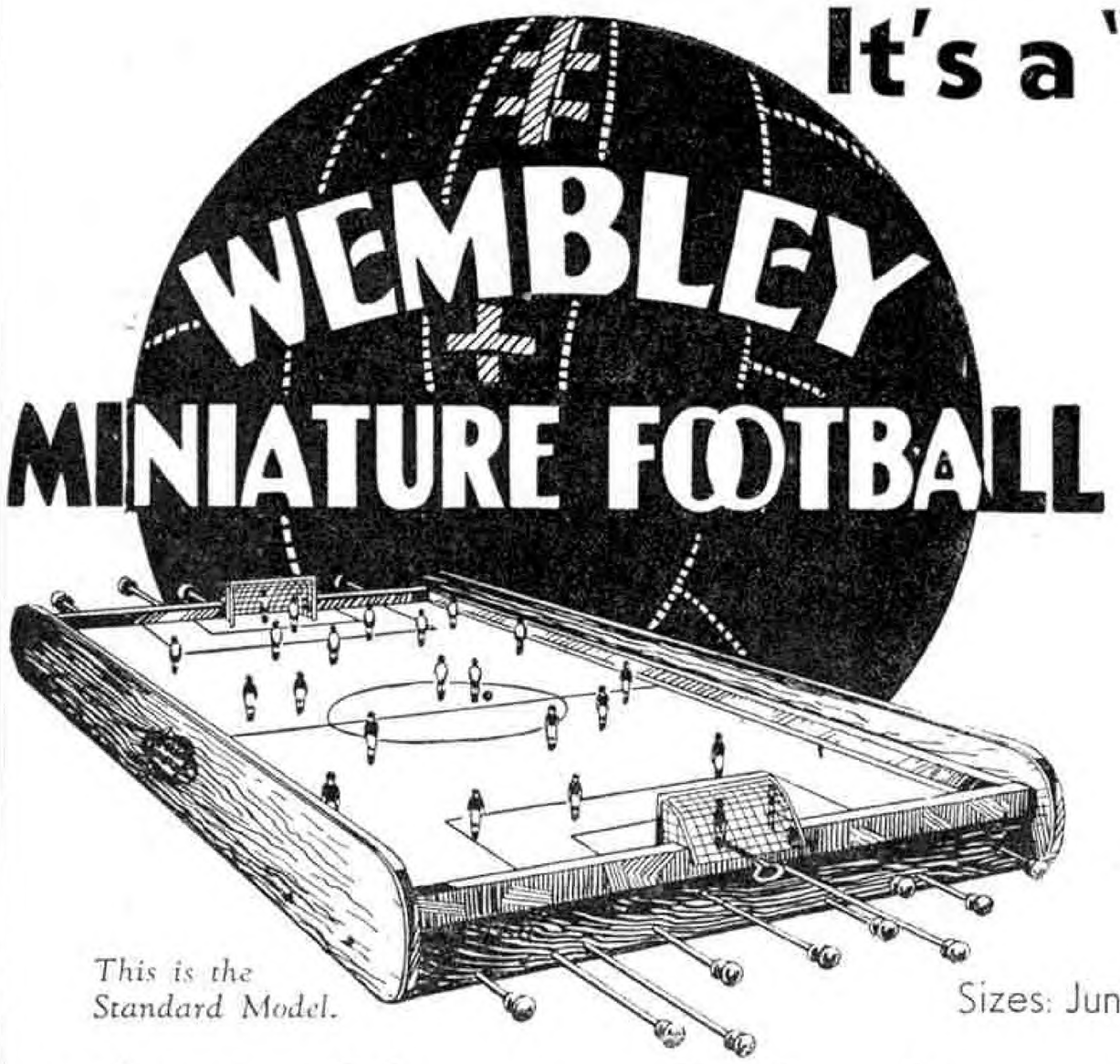
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STANDARD model **21/-** „ **1/3**

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Obtainable at all leading Stores and Toy Dealers

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ASAS

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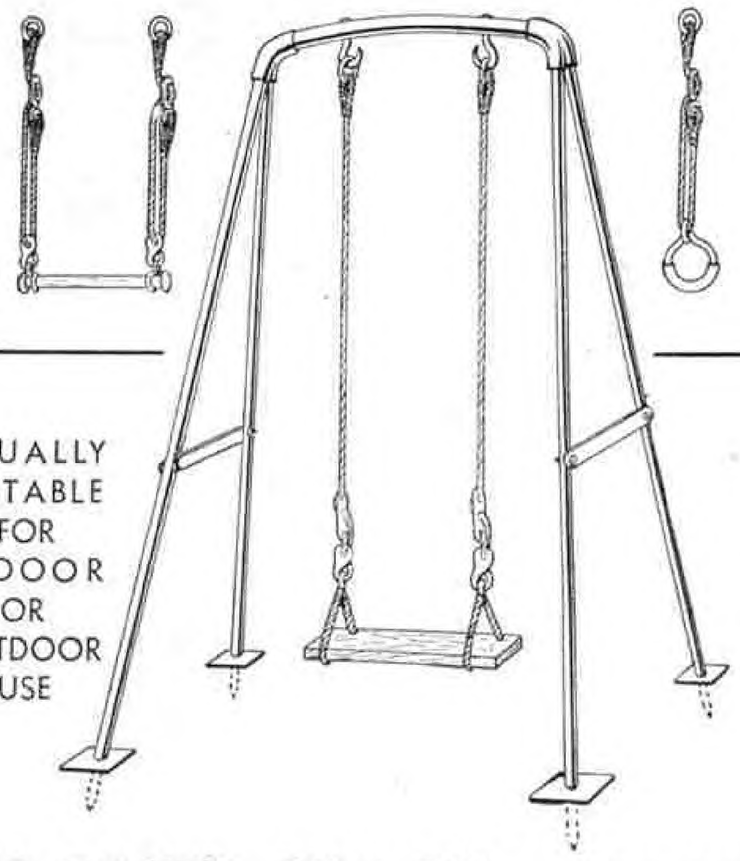
the

BLACKBURN "SKUA"

Constructive Set price 4/6

Assembled Model 12/6

MONTIL "KEEP-FIT" GYM OUTFIT



EQUALLY SUITABLE FOR INDOOR OR OUTDOOR USE

COMBINED SWING TRAPEZE AND GYM RINGS

THE MONTIL GYM SET

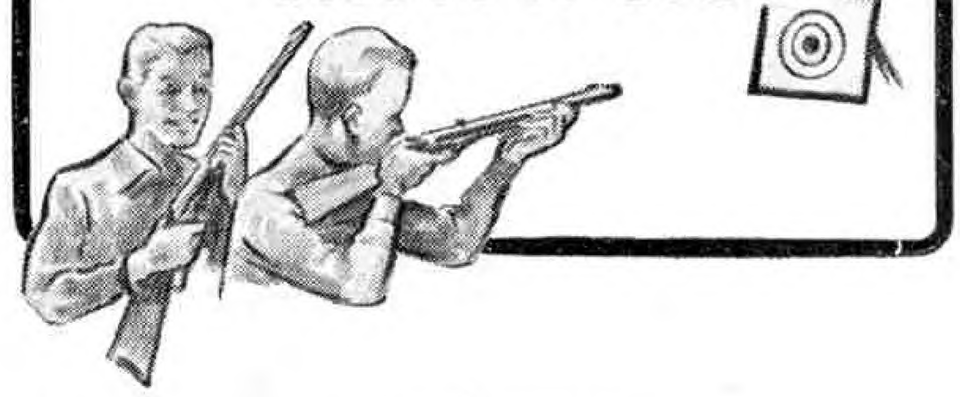
The set consists of an 8 ft. tubular steel stand in green cellulose finish, swing with rope, trapeze and leather covered rings. Price **£3.3.0.**

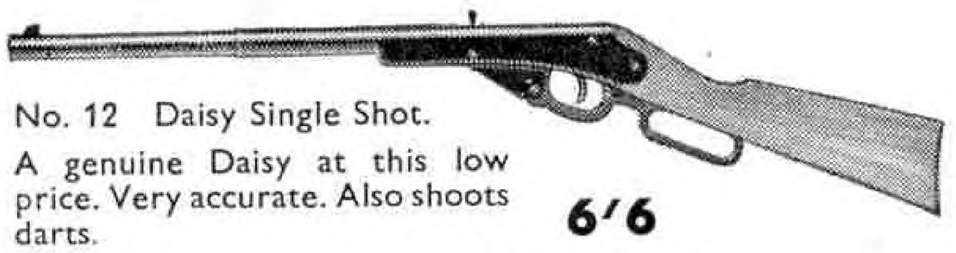
There is a junior set with swing trapeze, leather covered rings. Price **£2.12.6.**

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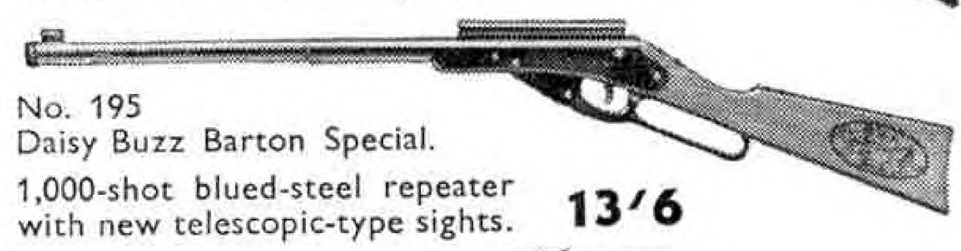




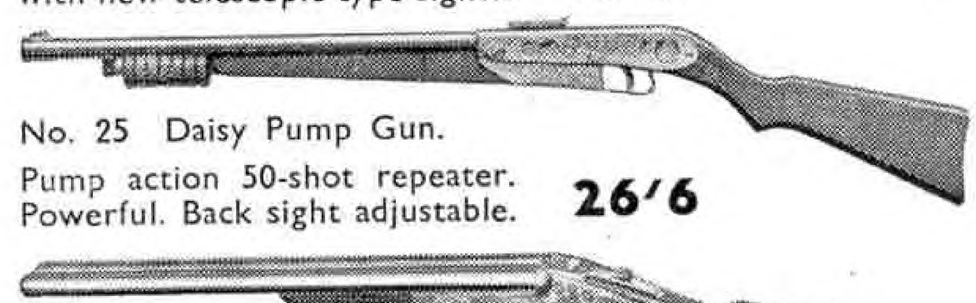
No. 12 Daisy Single Shot.
A genuine Daisy at this low price. Very accurate. Also shoots darts. **6/6**



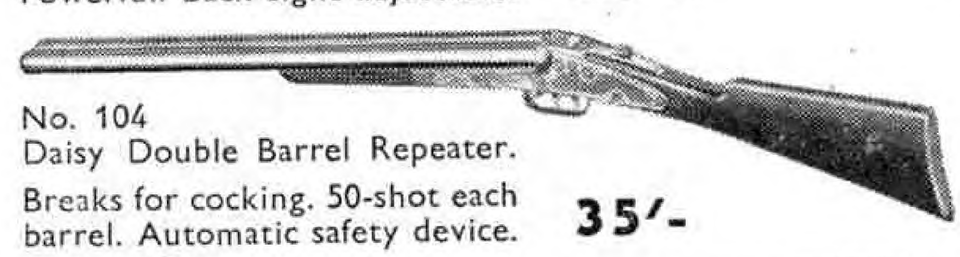
No. 11 Daisy 350 Shot.
Highly polished nickel finish 350-shot lever action repeater. **10/6**



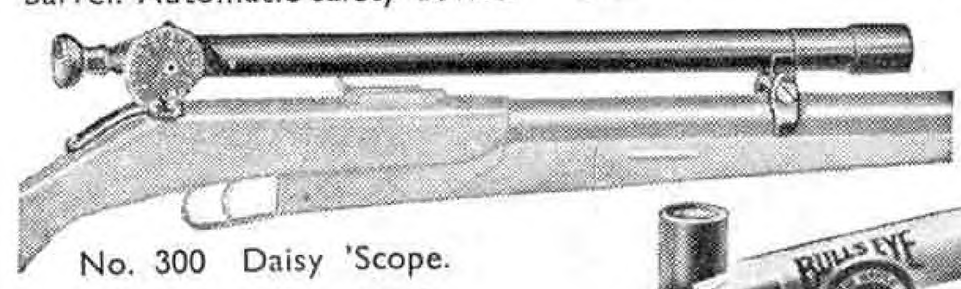
No. 195
Daisy Buzz Barton Special.
1,000-shot blued-steel repeater with new telescopic-type sights. **13/6**



No. 25 Daisy Pump Gun.
Pump action 50-shot repeater. Powerful. Back sight adjustable. **26/6**



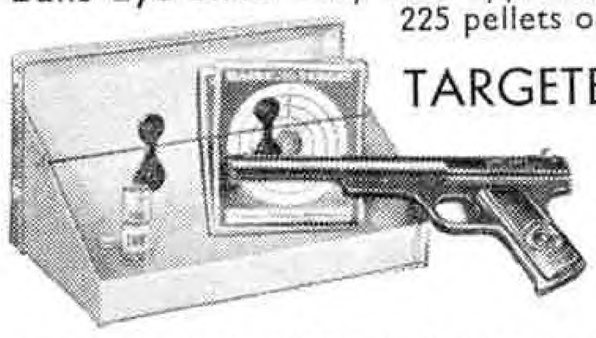
No. 104
Daisy Double Barrel Repeater.
Breaks for cocking. 50-shot each barrel. Automatic safety device. **35/-**



No. 300 Daisy 'Scope.
This sight fits all models. Two-power lens practically doubles size of image. **8/6**



Bulls Eye Shot. Only shot approved by Daisy engineers. Tube of 225 pellets only **4d.** per tube.



TARGETEER, the gun that's fun
Complete pistol target outfit. Repeating air pistol, 2 types of targets. Use box as a back-stop. Set up anywhere.
Complete **10/6**

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Stocked by all Leading Cycle and Sports Dealers.

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WONDERFUL MODEL SHIPS

True-to-Scale Show Models you can build!

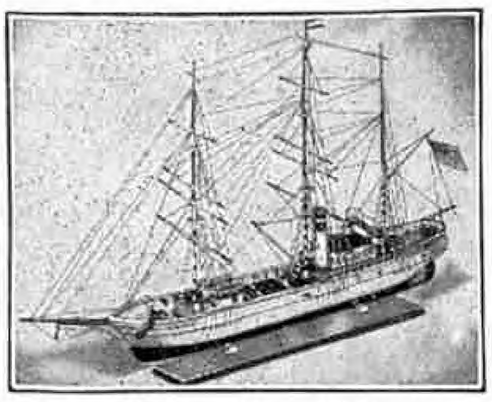
All Ship "fans" will be fascinated by the building of these exact scale models. The work is made easy by the full size plans and all materials being ready to hand. Think how fine one of these would look in your room!



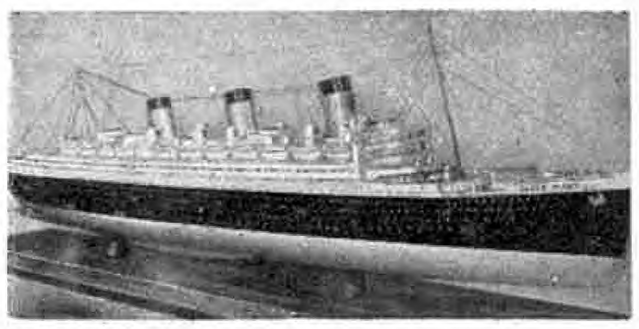
SPANISH GALLEON
Length 10 in. Splendid model of the "Armada" period. Easy to make. Complete kit with balsa hull, lacquers, etc. **2'6**



CONSTITUTION (above)
Length 12 in. Three masted American fighting ship with 20 deck cannons. Clear drawing of rigging. Complete kit with balsa, spars, cement, lacquers, etc. **2'6**



CITY OF NEW YORK (left)
Length 14 in. Very fine and most attractive model of interesting type sailing ship, with auxiliary motor. All sails shown in full. Complete kit with balsa hull, lacquers, ship's boats, many fittings, etc. **4'-**



QUEEN MARY
Length 18 in. Very detailed plan with many photographs showing all the small details. Ready shaped hull, and metal lifeboats, davits, anchors, propellers, etc., are provided. All balsa parts are clearly printed and dowelling for masts supplied, together with cement and coloured lacquers. **7'6**

CATALOGUE
Illustrated 12 page list with many kits and ship's fittings sent for 1½d. stamp. Abroad all kits carriage extra.



CUTTY SARK
Length 23 in. This is an exceptionally detailed model of the world-famous clipper ship. The plan is large and clear with very many helpful perspective drawings. The kit includes the ready shaped hull in best balsawood, many finished fittings, cement, coloured lacquers, spars, etc.
Carriage paid **15'6**

Also Smaller CUTTY SARK
Length 14 in. This is a smaller model of the same famous ship. The kit is complete with balsa, spars, cement, lacquers, many fittings, etc. **4'-**

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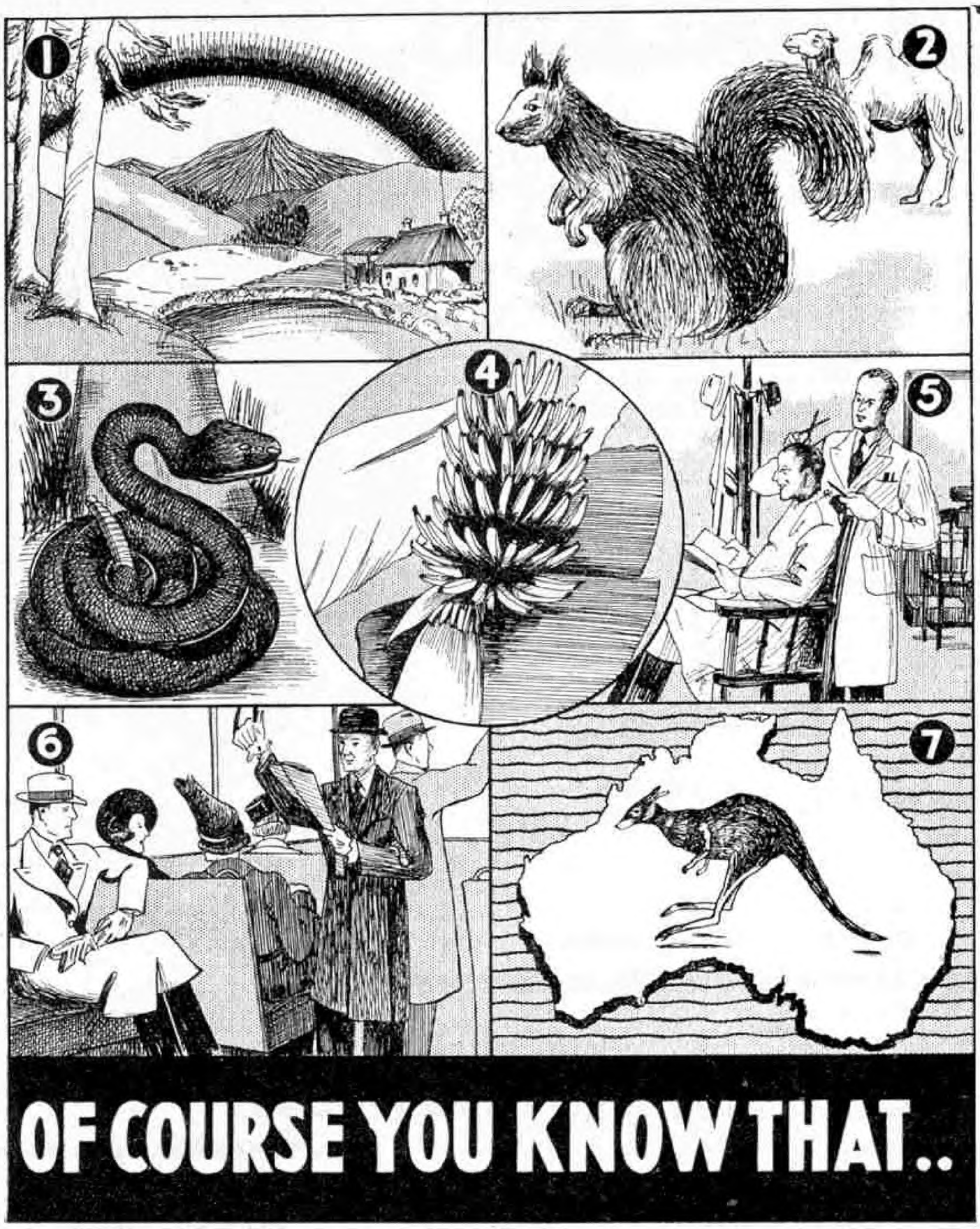
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DID YOU KNOW...

1. Rainbows that last from Sunrise to Sunset are common occurrences in Siberia?
2. Camel-hair has nothing to do with camels, but is the hair of squirrels?
3. All snakes are deaf?
4. The most productive of plants is the banana. The normal yield is 20 tons to the acre?
5. When a barber cuts your hair, he has, on the average, 450 snips with his scissors?
6. Strap-hanging is dangerous to the cartilage cushions of the spine?
7. Australia is 25 times the size of Britain, yet its population is less than that of Greater London?

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And just a word of warning—all **good** stationers stock SECCOTINE in the pin-stopper tubes at **4½d., 6d., 9d.**—so when you ask for SECCOTINE, make certain you get it—nothing else will do.



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I should like to have, post free, copies of your Free Booklets which describe the many uses of Seccotine.

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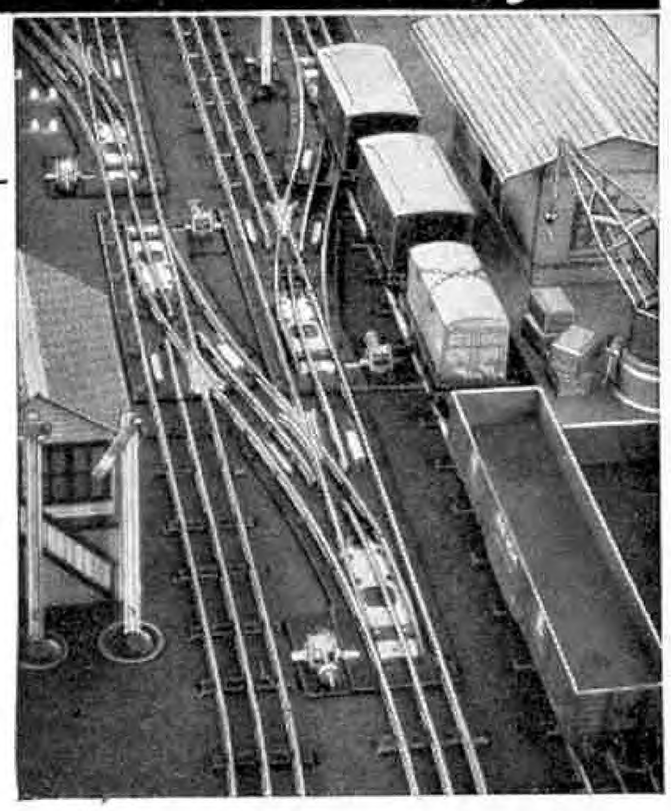
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SECCOTINE REGD.

The Double Strength ADHESIVE

The PERFECT track for Electric Model Railways

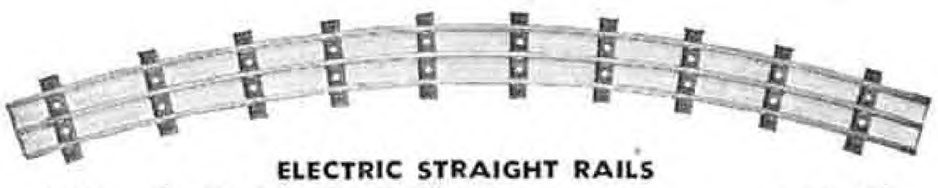
HORNBY SOLID STEEL RAILS



GAUGE O

GAUGE O

Although our standard tinplate rails are the acknowledged best of their class, we have felt that in order to do justice to the speed and hauling power of our locomotives, especially "PRINCESS ELIZABETH" and E420 "ETON," a drawn steel rail was essential. Our object was to produce the perfect miniature railway track, and we have achieved our aim in the new system of electric steel rails and points that we introduced recently. These rails are of the very highest quality, yet are sold at reasonable prices. We are confident that they will give satisfaction, not only to Hornby Train users, but to all model railway enthusiasts. The track is joined up by means of fishplates which are supplied with each rail.

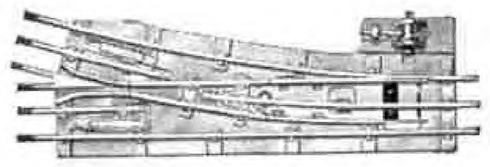


ELECTRIC STRAIGHT RAILS

EB3	Straight Rails (Length 23 in.)	each **2′8**
EB3½	Straight Half Rails	„ **1′7**
EB3¼	Straight Quarter Rails	„ **1′-**
	TSR Electrical Terminal for Solid Section Rail	per pair **4d.**

ELECTRIC CURVED RAILS

EA3	Curved Rails	each **2′8**
EA3½	Curved Half Rails	„ **1′7**



ELECTRICAL POINTS
(Hand Operated)

EPR3	Right-hand Points ...	each **8′3**
EPL3	Left-hand Points ...	„ **8′3**

FISHPLATES

FP For joining up track ... Price, doz. **6d.**

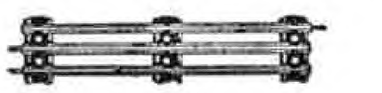
AP Adapting Pieces, for connecting Hornby Solid Steel Track to Hornby Tinplate Track ... ... Per box of six **1′-**

QUALITY FEATURES OF NEW ELECTRIC SOLID STEEL TRACK

1. RAILS. Solid drawn steel section, zinc coated to prevent rust and to ensure good electrical contact. The space required for a circle made up of 10 Curved rails is 6ft. 8in.
2. SLEEPERS. Pressed steel, of similar design to the steel sleepers used on actual railways. Each sleeper is pierced so that the track can be screwed down to a wood base.
3. POINTS. On solid base, providing the greatest possible rigidity. Lever movement simple and positive. Right-hand and Left-hand points available.

Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

HORNBY TINPLATE TRACK



EB1



ECR



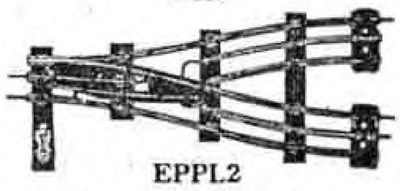
EA2½



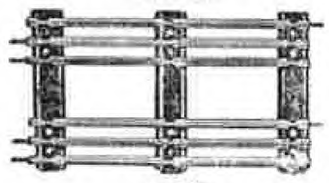
EB½



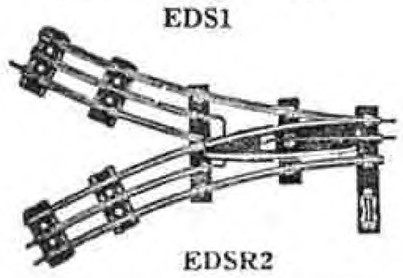
EA2



EPPL2



EDS1



EDSR2

GAUGE O, 1¼". HORNBY SERIES.

Hornby Rails, Points and Crossings are built for hard wear and for smooth running.

There is practically no limit to the number of rail formations that can be built with them. Their adaptability is well shown in the booklets "How to Plan your Hornby Railway" and "Hornby Layouts–100 Suggestions," both of which may be obtained from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d.

A SELECTION OF RAILS, POINTS AND CROSSINGS FOR ELECTRIC TRAINS

EB1 Straight rails ... ... per doz. 6/–
EB½ „ half rails ... „ „ 5/–
EA2¼ Curved quarter rails (2 ft. radius) ... ... „ „ 4/6
EA2 Curved rails (2 ft. radius) „ „ 6/–
EPPR2 Parallel points, right-hand ... ...
EPPL2 Parallel points, left-hand ... ...
These points can be used with either 1 ft. or 2 ft. radius track. } per pair 7/–

EPR2 Right-hand points (2 ft. radius) ... ...
EPL2 Left-hand points (2 ft. radius) ... ... } per pair 8/–
EPR1 Right-hand points (1 ft. radius) ... ...
EPL1 Left-hand points (1 ft. radius) ... ... } per pair 6/6

EDS1 Straight rails, double track ... ... ½ doz. 8/6

EDSR2 Double symmetrical points, right-hand (2 ft. radius) ... ...
EDSL2 Double symmetrical points, left-hand (2 ft. radius) ... ... } per pair 7/–

EDSR1 Double symmetrical points, right-hand (1 ft. radius) ... ...
EDSL1 Double symmetrical points, left-hand (1 ft. radius) ... ... } per pair 7/–

FOR CLOCKWORK TRAINS

B1 Straight rails ... ... per doz. 4/–
A1 Curved rails (1 ft. radius) „ „ 4/–
PR1 Right-hand points (1 ft. radius) ... ...
PL1 Left-hand points (1 ft. radius) ... ... } per pair 3/6

PR2 Right-hand points (2 ft. radius) ... ...
PL2 Left-hand points (2 ft. radius) ... ... } per pair 3/6

CA2 Acute-angle crossings (for 2 ft. radius track) ... each 1/6

PPR2 Parallel points, right-hand ... ...
PPL2 Parallel points, left-hand ... ...
These points can be used for either 1 ft. or 2 ft. radius track. } per pair 4/–

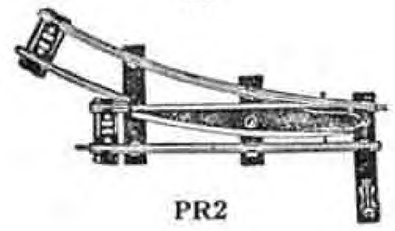
DC2 Curved rails, double track, 2 ft. radius only ... ½ doz. 6/–

Ask your dealer for an illustrated price list.

MECCANO LIMITED, Binns Road, Liverpool 13



B1



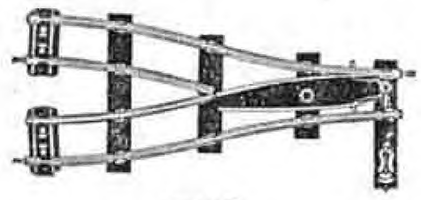
PR2



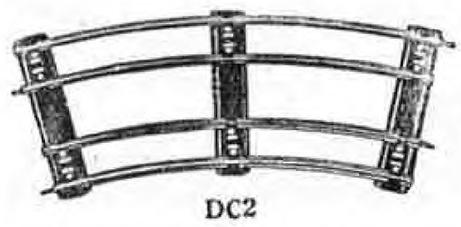
A2



CA2



PPR2



DC2

The Perfect Xmas Gift

MAMOD

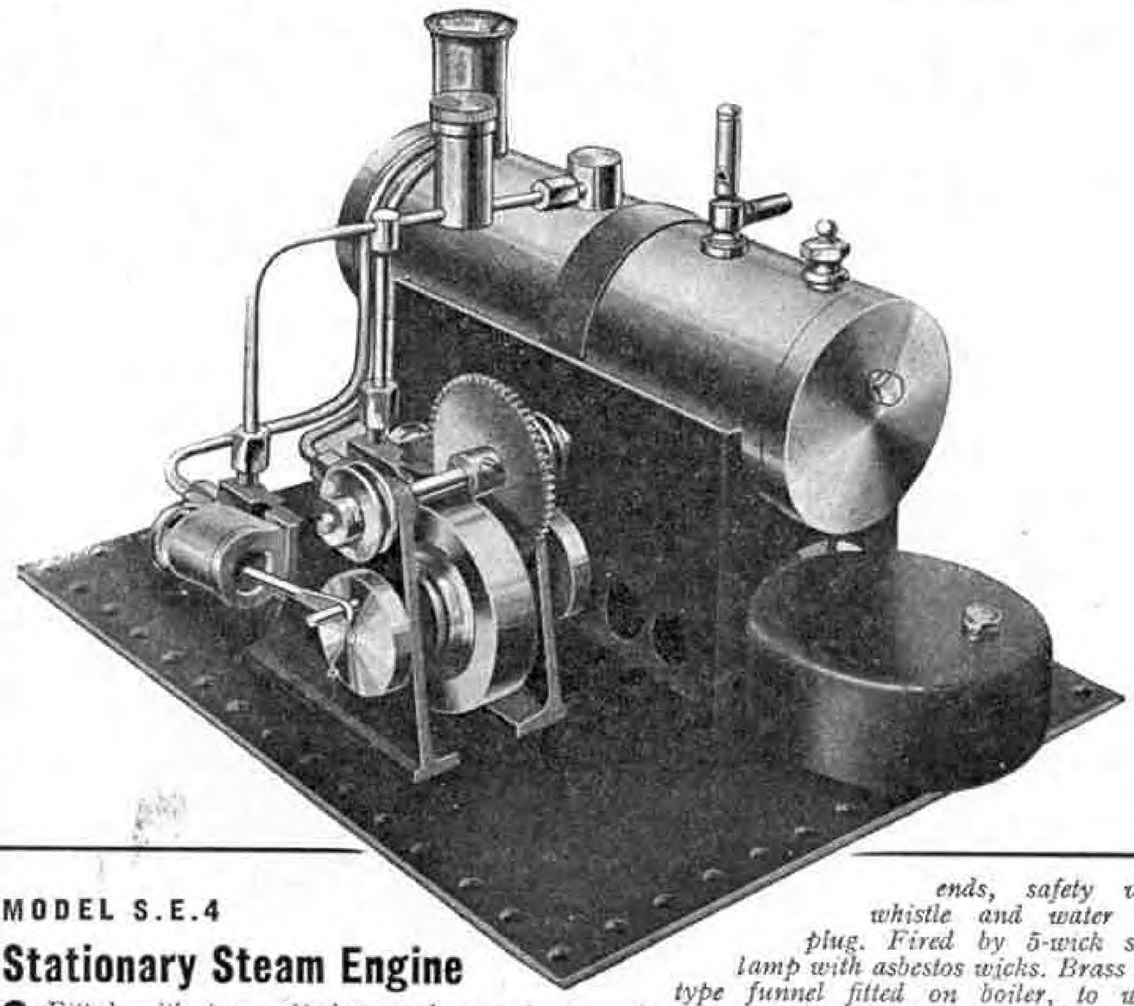
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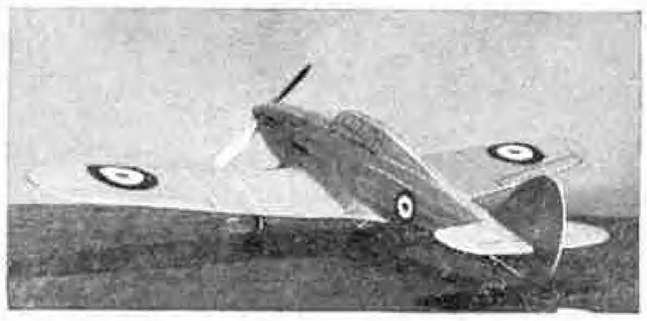
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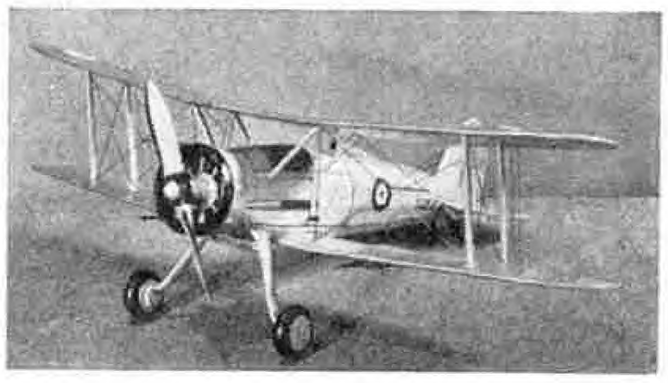


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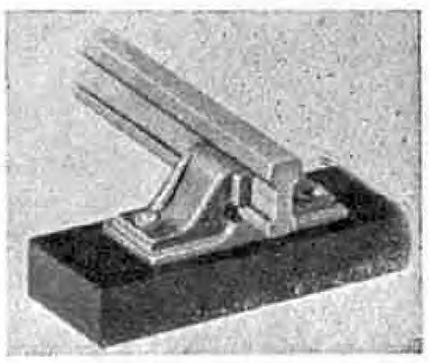
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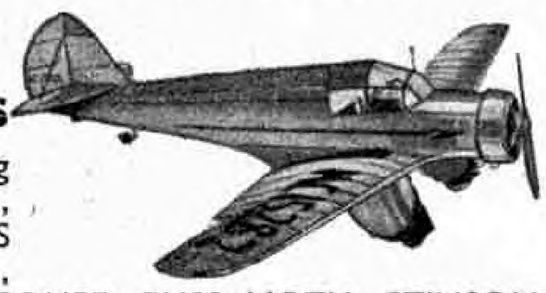


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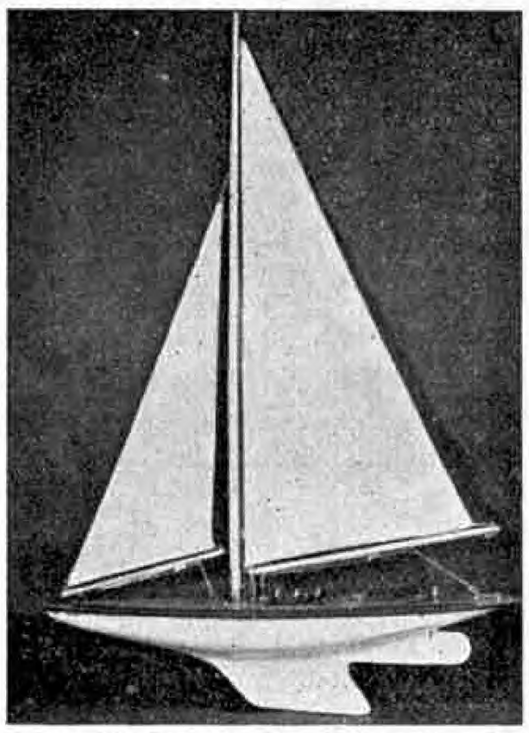
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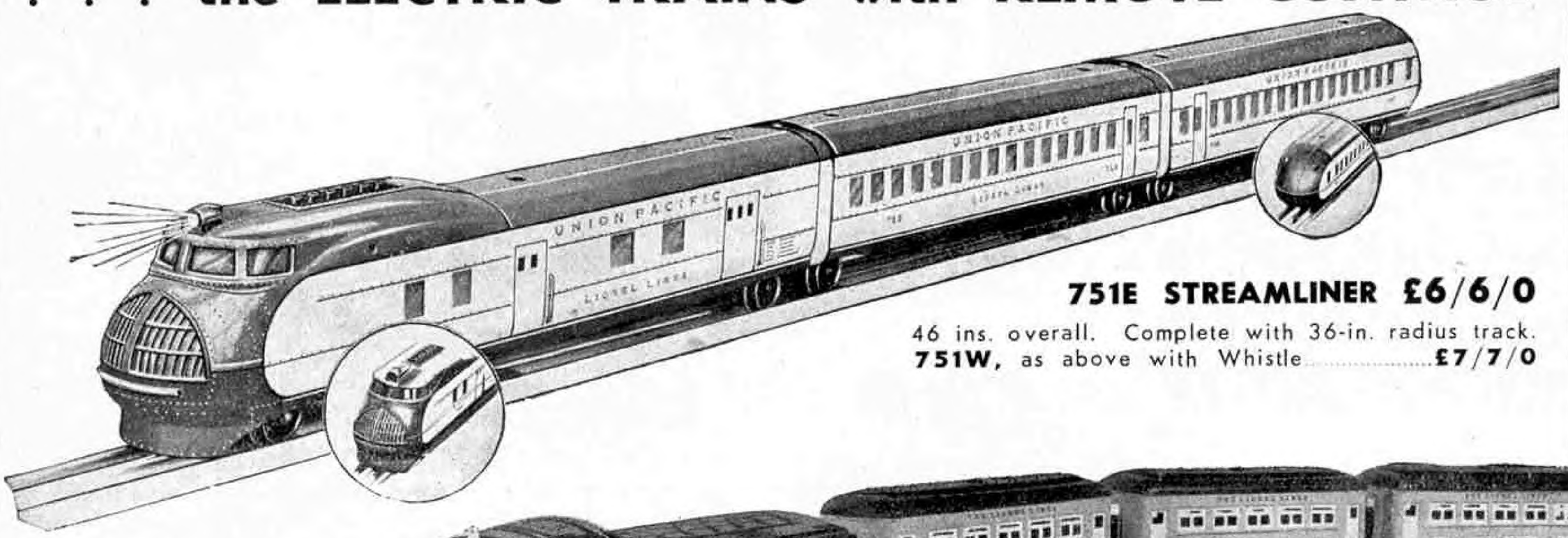
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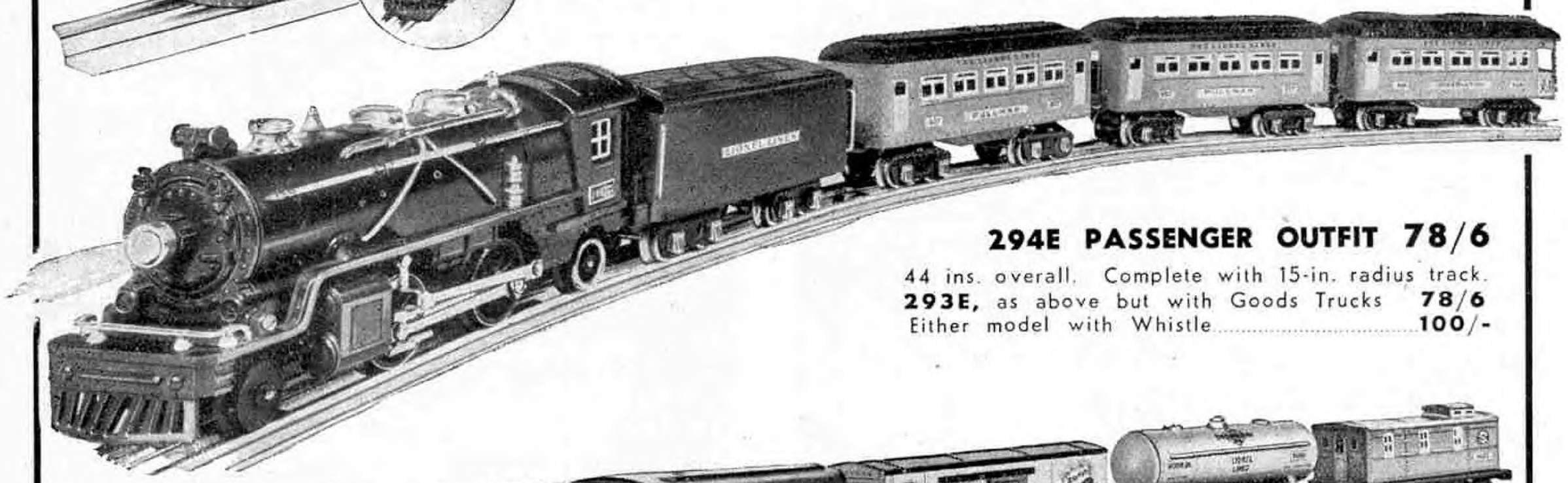
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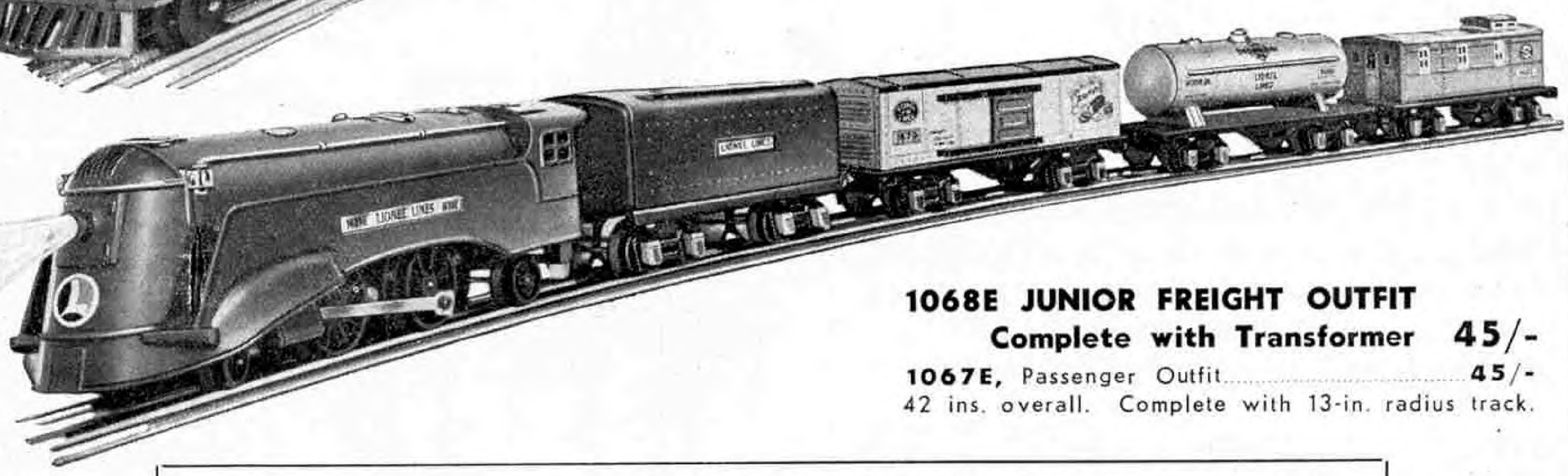
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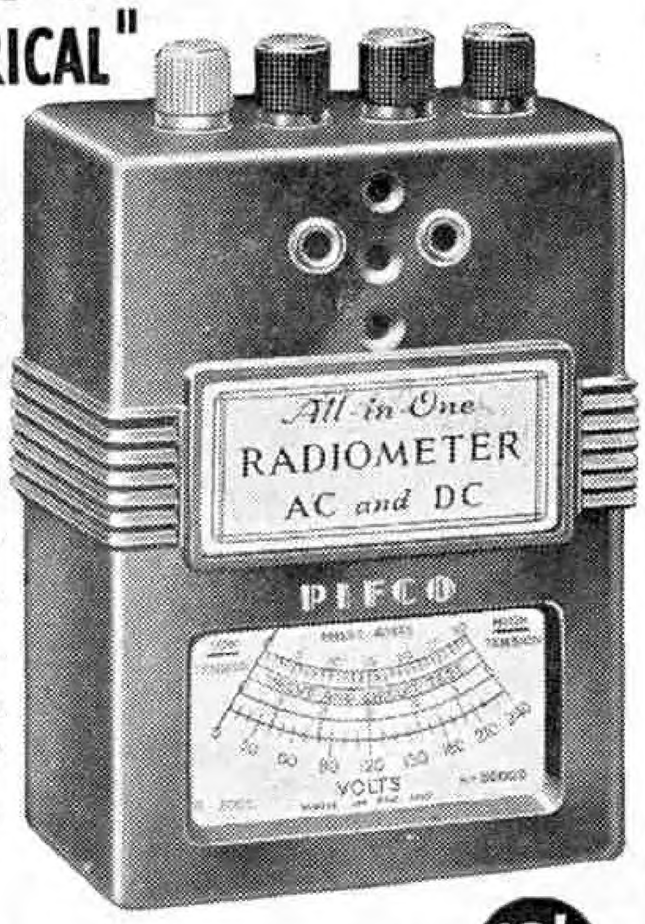
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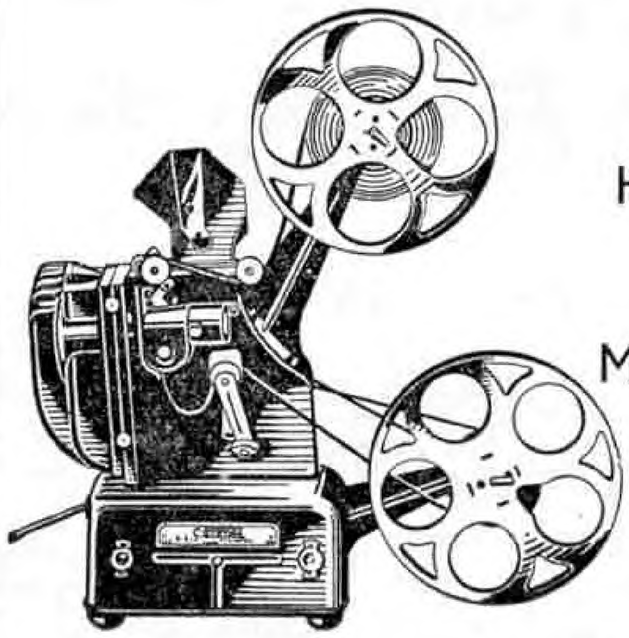


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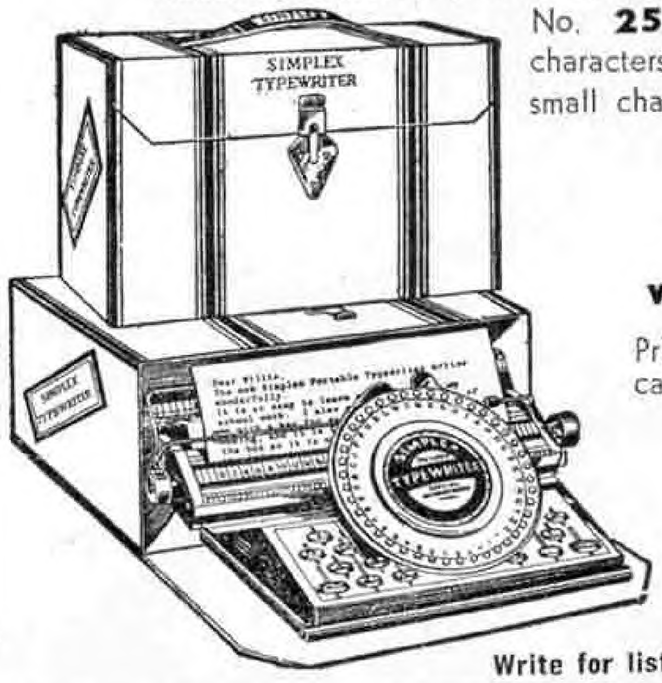
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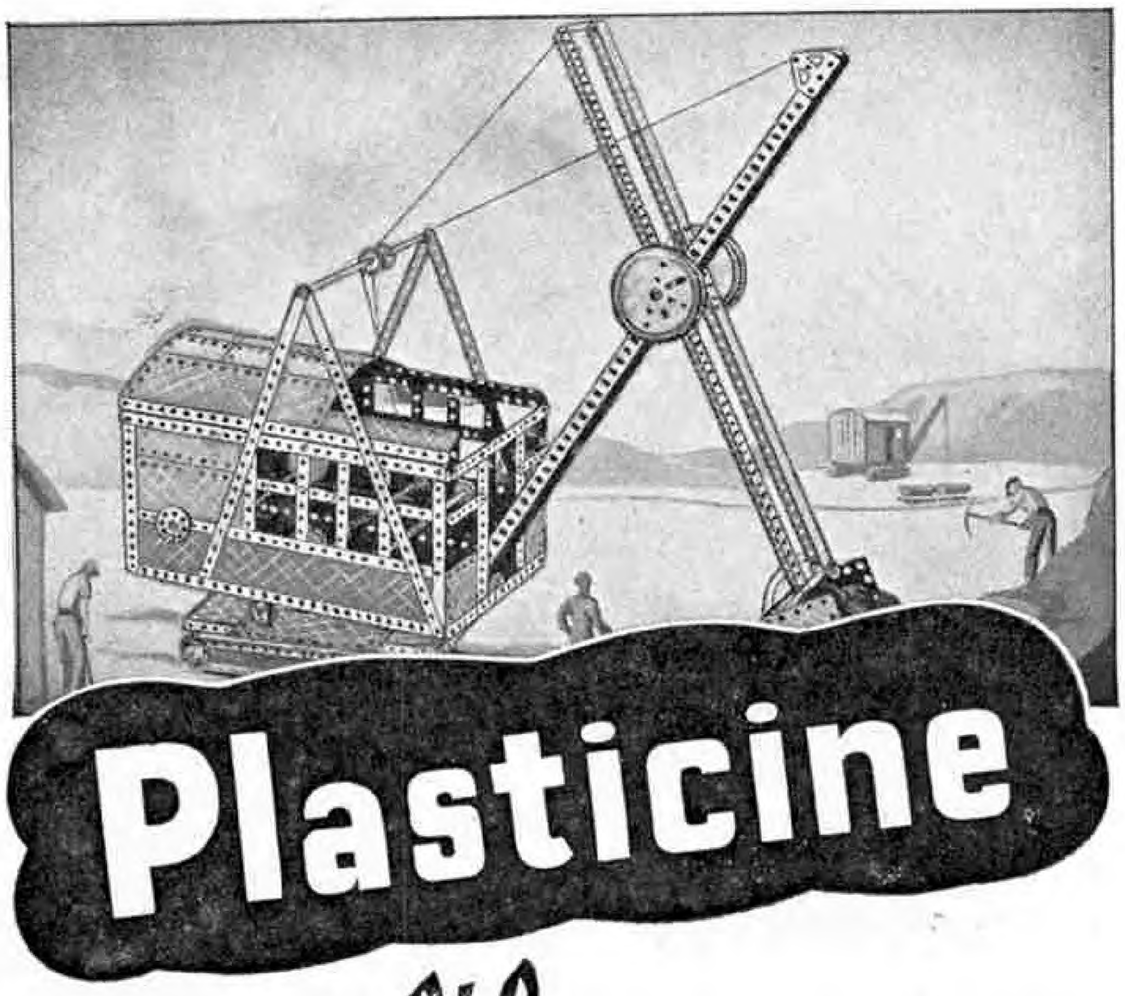


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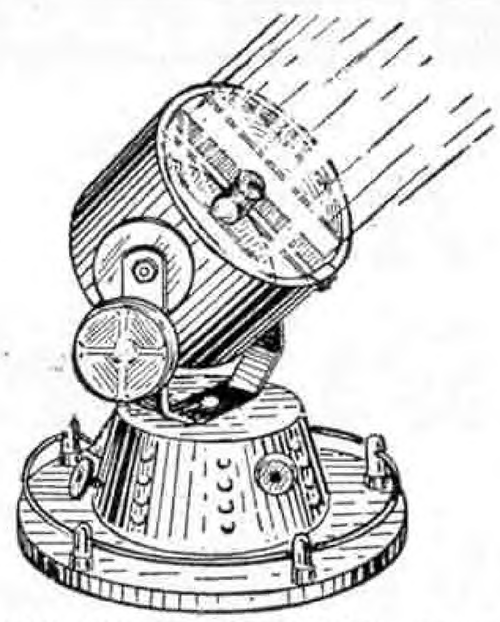
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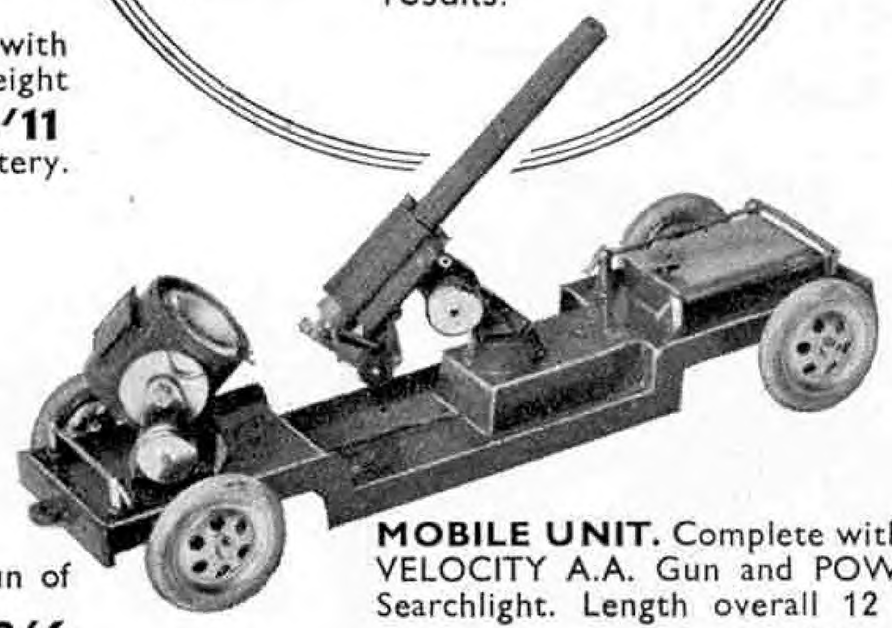
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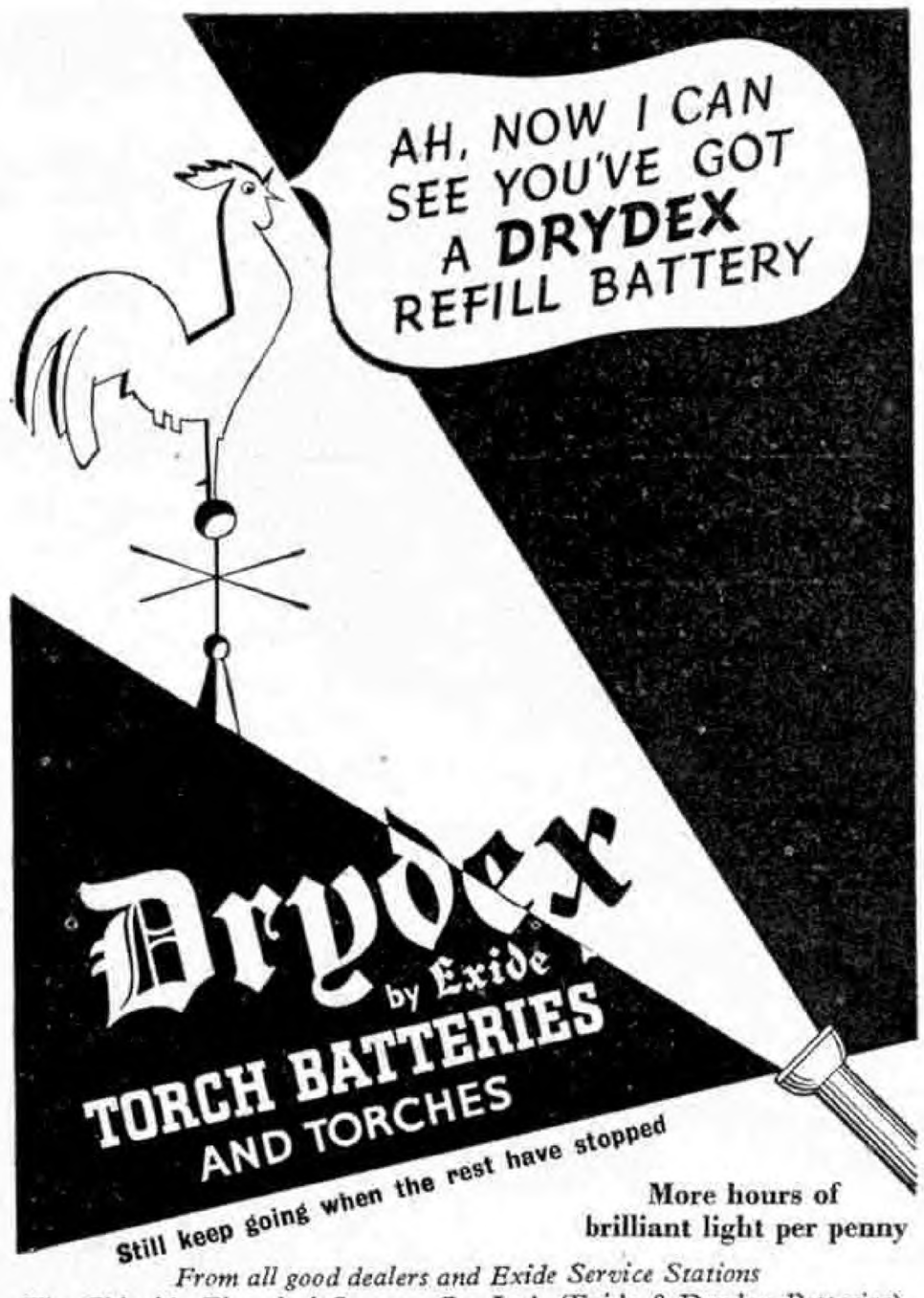
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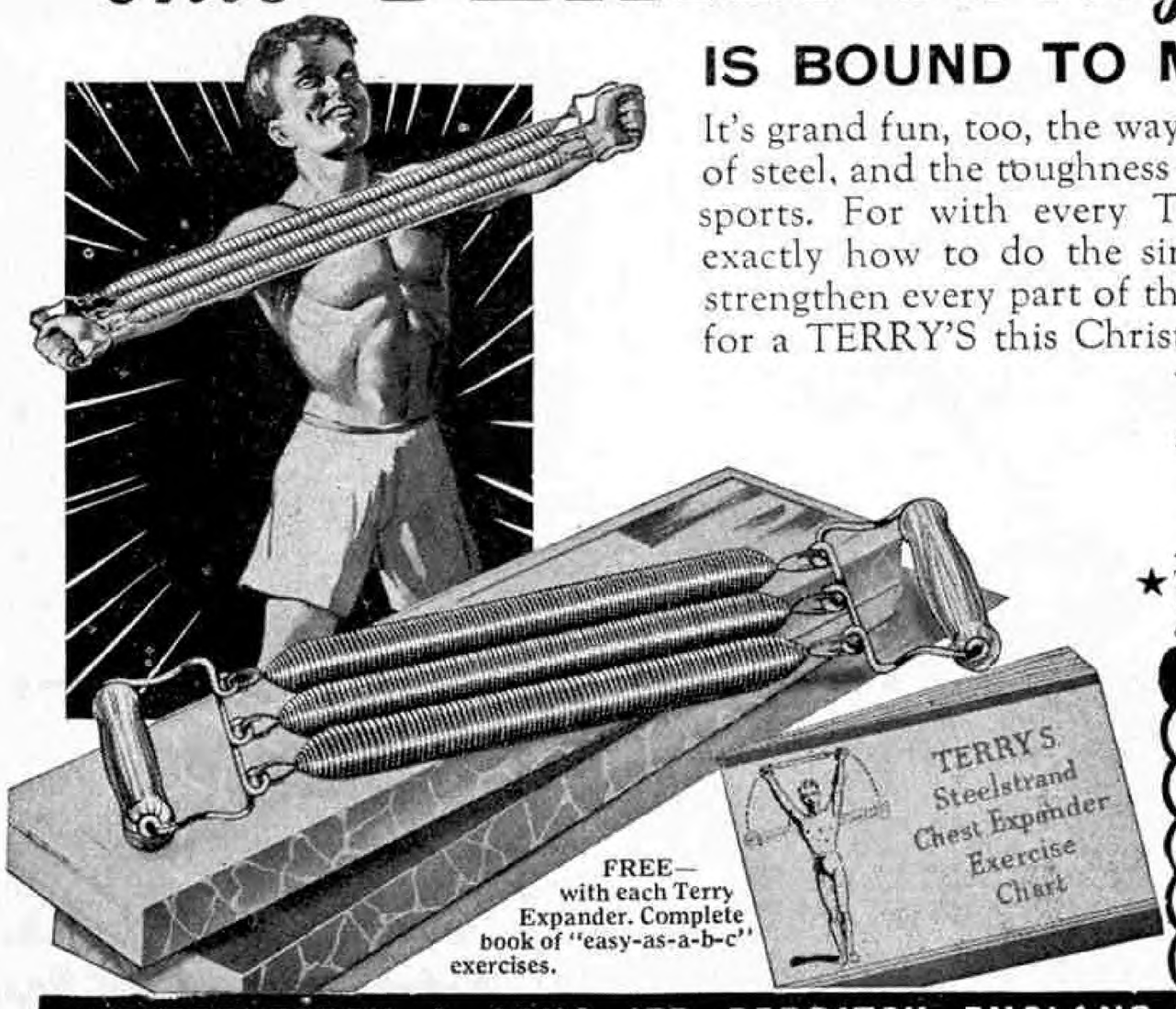
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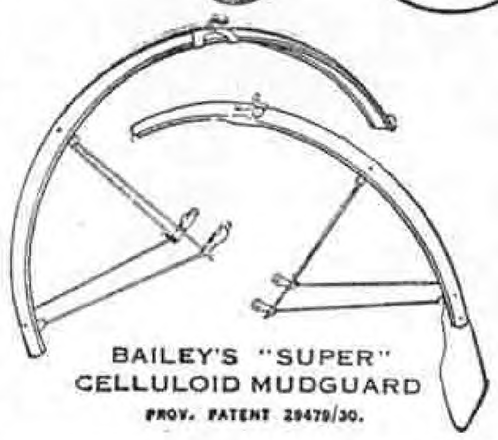
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Stamp Advertisements continued from page 736

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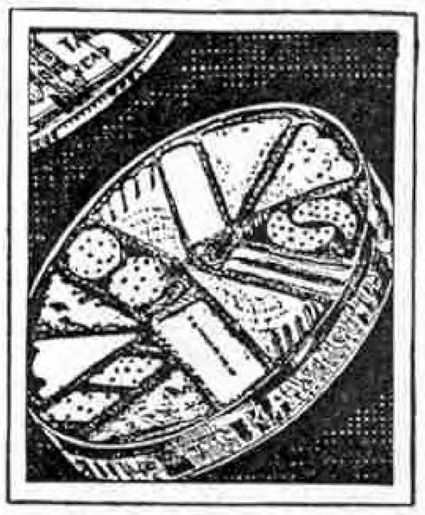
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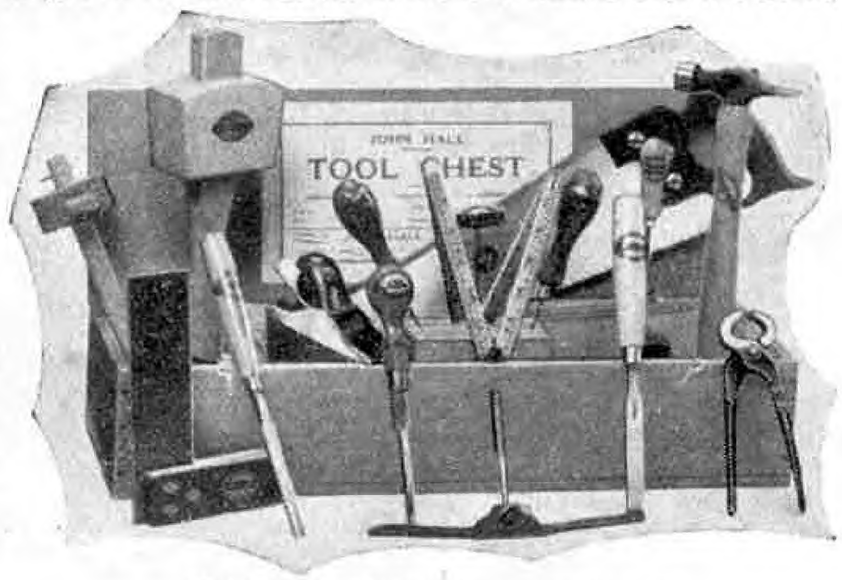
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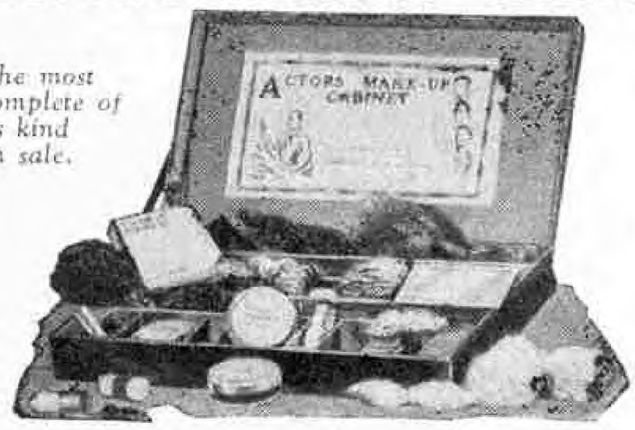
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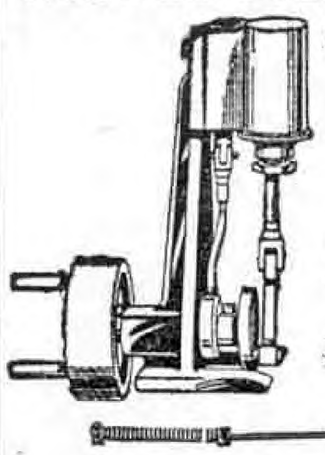


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READERS' SALES

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Sale. Red/Green Meccano including Electric Motor. Cost over £10/15/–. Will take £5/5/–. List of parts on request. 65 "M.M.'s," from May 1932 to November 1937. Three missing, 12/6.—B. Irving, 81, Gargrave Road, Skipton, Yorks.

Sale. Red-Nickel Meccano, nearly equivalent late No. 5. One Clockwork Motor. Good condition. 35/– or nearest offer.—Bussey, 1, Helena Road, Norwich.

Sale. No. 3 Red/Green Meccano and spares. Miniature Typewriter. Gauge O Clockwork Train. Combined Magic Lantern and Cinematograph with Films. 150 piece Farmyard. Offers.—Bowen, 55, Lodge Road, West Bromwich.

For Sale. Red/Green Meccano, including Motors, Aero Outfit and Resistance Controller. Cost £12/12/–. In excellent condition and packed in strong Wooden Chest. No reasonable offer refused. Apply—Albany Ward, 24, Dixs Field, Exeter.

Two-masted Clipper-Schooner Sailing Ship, in glass case, expert workmanship, £10.—Boullier, Epworth Manse, Dundrum, Belfast.

Well arranged Stamp Collection (catalogued over £10), in Album containing 22 Coloured Maps. £3 or nearest. Send stamp for particulars.—Riley, 14, Rolleston Drive, Wallasey.

Sale. 75 "M.M.'s," 1929 to 1936. 1,000 Cigarette Cards. Offers.—Lumb, Clarendon Place, Halifax, Yorks.

Sale. B.L. Royal Scot, Clockwork, 30/–.—Payne, 39, Revell Road, Kingston, Surrey.

"Meccano Magazines," March 1932 to October 1937, less August 1935. 12/– or nearest.—G. Tate, 44, Clarendon Road, Leeds 2.

Bowman Tank Loco, 12/6; ditto, unused, Track, 15/–.—65, Shelbourne Road, Tottenham.

Sale. Red/Green Meccano. Electric and Clockwork Motors. Cost £11/10/–. Take £4/10/–. Also "M.M.'s," from February 1930 to date, good condition, £1.—Holden, The Square, Great Eccleston, nr. Preston, Lancs.

Sale. Red/Green Meccano Parts, E6 Motor, Transformer. In Storage Box. Perfect condition. Value £10. £6 or offers. Write for list.—Thomas, 129, Crwys Road, Cardiff.

Sale. Wireless components. Stamp for list.—Howard, 104, The Avenue, Ealing, London.

Half Price to clear. Locomotives, Hobbies Speed Boats, Rails, etc. Write for list.—Mold, 2, Eastmont Road, Esher, Surrey.

"M.M.'s," Oct. 1936–Oct. 1938. Majority perfect. 6/–.—McTaggart, 2, Meadowbank Street, Dumbarton.

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Sale. Hornby Stock, no longer catalogued. Send for list.—Gibson, Caldene House, Woodroyd, Luddendenfoot, Yorks.

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Sale. "M.M.'s," 1936-8; "Magnets," 1937-8; Offers? Red/Green Meccano, worth £7. Take 65/–. Stamp for list.—80, Netherlands Road, New Barnet.

Sale. "Meccano Magazines," March 1932 to September 1937. Excellent condition. Offers?—Adams, 24, St. John's Road, March, Cambs.

"Meccano Magazines," Jan.–June 1930 bound; March 1932–June 1938, new condition. Offers.—Pullen, 11, Gracedale Road, Streatham, S.W.16.

Powerful Bowman Twin Cylinder Steam Engine, 7/6; "Britains" No. 2 Heavy Howitzer, 3/6. Wireless parts. Stamp for list. Carriage paid.—Wilkins, 75, Becley Road, Redditch.

70/– Red/Green Meccano, sell for 30/–.—E. Vallance, 58, Anston Avenue, Worksop, Notts.

Meccano Red/Green No. 5. Good condition. Cost 70/–. Accept 35/–.—Anson, 247, Kingston Road, Willerby, Hull.

T.T. Train, as new. Cost £8. Will take £2/2/–. Also old style E6 Meccano Motor with Transformer, 10/–.—273, Creighton Avenue, East Finchley, London N.2, or Tudor 3241.

Sale. Parts Gauge O extensive Clockwork Railway.—54, Priory Road, High Wycombe.

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Stamp Collection for Sale. Write—Pritchard, 62, Melwood Drive, Liverpool 12.

Sale. Gauge O Clockwork Railway. Cost over £9/10/–. 3 Locos. Take £4 or near offer.—Buckle, 1, Terrace, Shenfield, Brentwood, Essex.

Gauge O Clockwork Locos, Stock, Track. £4 lot or from List. Unbound "Meccano Magazines," 1931 to 1938, 16/–.—Close, Walton Road, Walton-on-Naze.

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Photographs of the new vessel after launch now available. Send 3d. for specimen postcard and our illustrated Lists of over 1,150 different real photographs of Liners, Freighters, etc., 2d. each, 2/- per dozen, post free. New photographs include: "Clyde Coast," "Cilicia," "Rochester Castle," "Essex," "City of Bombay" and "Imperial." **B. & A. FEILDEN (MM), 12, HARLECH ROAD, BLUNDELLSANDS, LIVERPOOL 23.**
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The "*M.M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall. Price 6d. per copy. As a rule, back numbers cannot be supplied, because we print only sufficient copies to fill our standing orders. To prevent disappointment, therefore, place a regular order either with your dealer, newsagent, or direct with this office.

Meccano Limited, Binns Road, Liverpool 13.

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Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free), Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.

UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.

AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.

NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.

SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

INDIA: Karachi: Daryanamal and Bros., Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao, Calcutta; Bombay Sports Depot, 2, Lindsay Street, Madras; Bombay Sports Depot, 162, Mount Road.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

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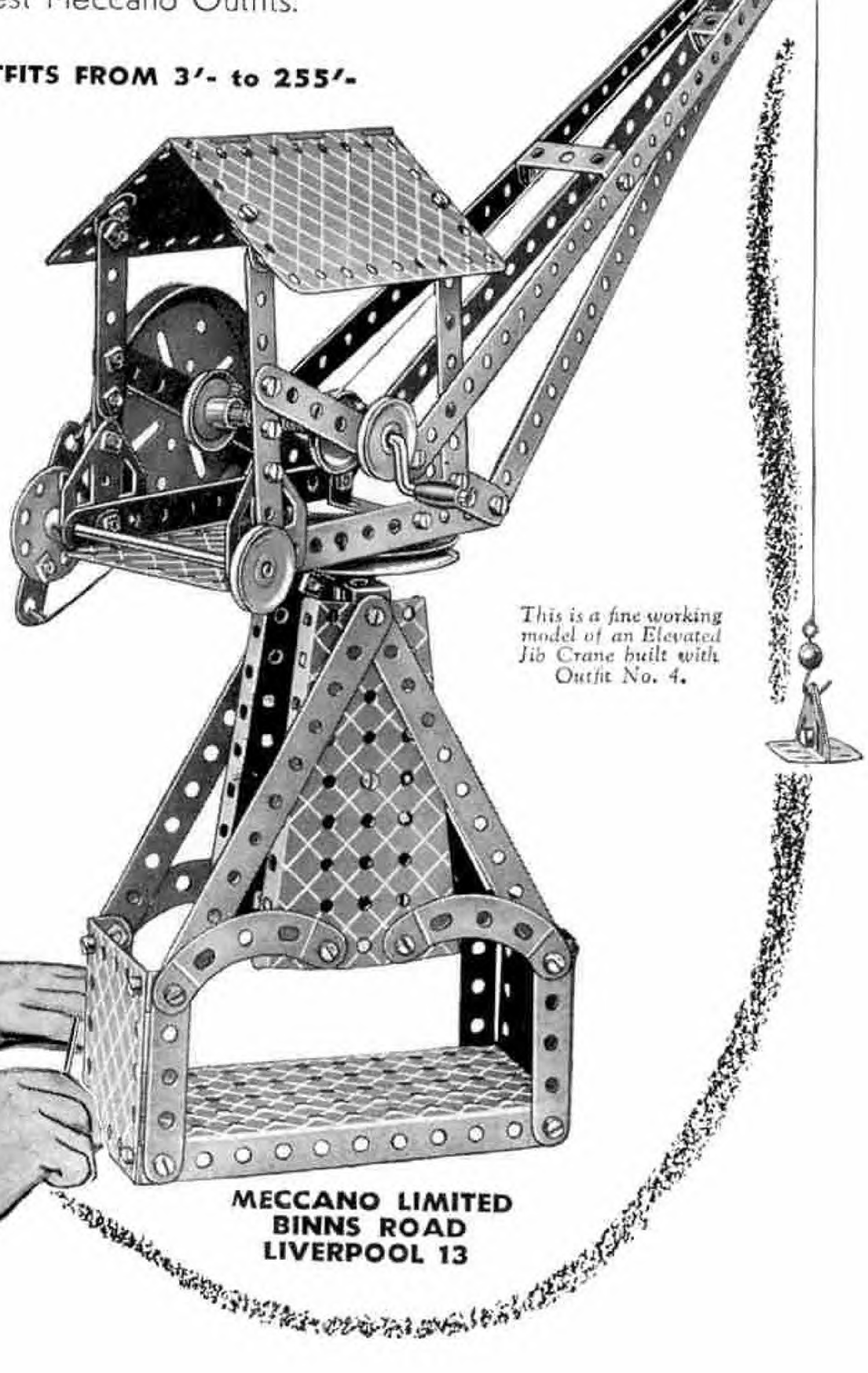
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